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AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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For related information see also *Astronautics*.

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02 AERODYNAMICS **2254**

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

03 AIR TRANSPORTATION AND SAFETY **2258**

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION **2259**

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command and Tracking* and *32 Communications*.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE **2259**

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

06 AIRCRAFT INSTRUMENTATION **N.A.**

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For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

07 AIRCRAFT PROPULSION AND POWER **2260**

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

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08 AIRCRAFT STABILITY AND CONTROL **2264**

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09 RESEARCH AND SUPPORT FACILITIES (AIR) **2265**

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For related information see also *Aeronautics*

12 ASTRONAUTICS (GENERAL) **2265**

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

13 ASTRODYNAMICS **2269**

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14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) **2270**

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

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16 SPACE TRANSPORTATION **2281**

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

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For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE **2281**

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION **2283**

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20 SPACECRAFT PROPULSION AND POWER **2283**

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28 PROPELLANTS AND FUELS 2303
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73 NUCLEAR AND HIGH-ENERGY PHYSICS **2406**
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS **2407**
Includes light phenomena.

75 PLASMA PHYSICS **2409**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **2412**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **2415**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **N.A.**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **2416**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 2417
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 2419
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 2419
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 2420
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 2421

89 ASTRONOMY 2423
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 2425
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 2425
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 2428
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 2429
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 2429

Note: N.A. means that no abstracts were assigned to this category for this issue.

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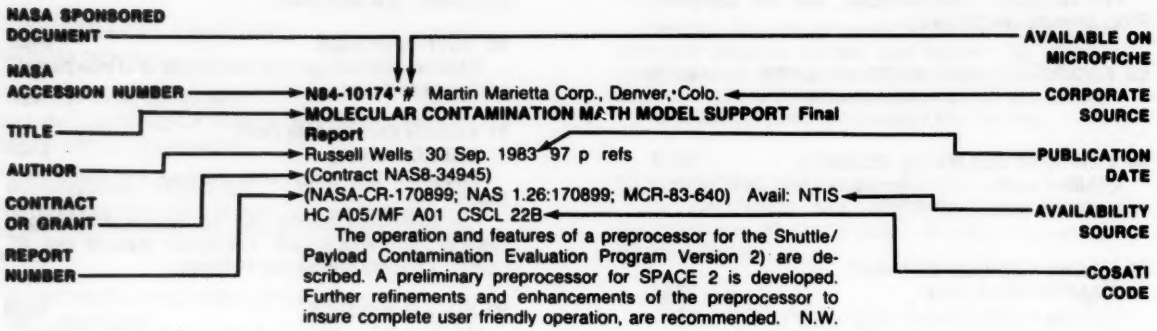
TYPICAL CITATION AND ABSTRACT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COSATI CODE
N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

VOLUME 22 NUMBER 15/AUGUST 8, 1984

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N84-24528*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
V/STOL WIND-TUNNEL TESTING
David G. Koenig May 1984 74 p refs
(NASA-TM-85936; A-9694; NAS 1.15:85936) Avail: NTIS HC A04/MF A01 CSCL 01B

Factors influencing effective program planning for V/STOL wind-tunnel testing are discussed. The planning sequence itself, which includes a short checklist of considerations that could enhance the value of the tests, is also described. Each of the considerations, choice of wind tunnel, type of model installation, model development and test operations, is discussed, and examples of appropriate past and current V/STOL test programs are provided. A short survey of the moderate to large subsonic wind tunnels is followed by a review of several model installations, from two-dimensional to large-scale models of complete aircraft configurations. Model sizing, power simulation, and planning are treated, including three areas is test operations: data-acquisition systems, acoustic measurements in wind tunnels, and flow surveying. Author

N84-24529# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Control Systems Development Branch.
PROCEEDINGS OF THE WORKSHOP ON MULTIVARIABLE CONTROL SYSTEMS Final Report, Mar. 1982 - Sep. 1983
Michael A. Masi and Daniel E. Russ Sep. 1983 667 p refs Workshop held at Wright-Patterson AFB, Ohio, 3 Dec. 1982
(AD-A139050; AFWAL-TR-83-3098) Avail: NTIS HC A99/MF A01 CSCL 01/3

The advent of highly augmented flight control systems, system integration at all levels, and the use of multiple function control surfaces, has led to the extensive requirement for multivariable multi-input/multi-output control systems. The need for alternative multivariable design techniques was documented. The present control law design methodologies of linear quadratic regulator (LOR), eigenvalue/eigenvector assignment, and classical single input/output do not always meet the handling qualities performance and control system specifications, i.e., phase and gain margins and bandwidth, without modification to cope with the high dynamic uncertainties of an aircraft. Application of singular perturbation method of asymptotic eigenvalue assignment as applied to control systems has progressed from modal control theory through complete eigenstructure assignment to the use of high gain feedback to the use of output feedback for error-actuated tracker controllers using the method described for the design of several multivariable control systems. For individual titles, see N84-24530 through N84-24535.

N84-24530# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
MULTIVARIABLE CONTROL LAW THEORY **c08**
In its Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 8-37 refs (For primary document see N84-24529 15-01)
Avail: NTIS HC A99/MF A01 CSCL 01/3

A summary of the techniques used in the design of high performance tracking systems for aircraft control is provided. A discussion of important facets in their application is also included. The theoretical discussions cover the discrete case and the corresponding continuous design equations. This approach is taken because, although the designs are for a digital implementation, the insight and experience with continuous design principles is used effectively. The methods are essentially identical for continuous and discrete designs. It is often more meaningful to consider the s-plane root locations and migrations as opposed to z-plane analysis. For those cases where the continucus methods are employed, sampling effects and discrete time delay must be examined prior to design acceptance. Author

N84-24531# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
MULTIVARIABLE CONTROL LAWS FOR THE AFTI/F-16 M.S. Thesis **c08**
A. Finley Barfield *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 41-256 ref Previously announced as N84-18210 (For primary document see N84-24529 15-01)
(AFIT/GE/EE/83S-4) Avail: NTIS HC A99/MF A01 CSCL 01/3

Recently evolved multivariable design techniques are used to develop control laws for the AFTI/F-16. Designs are investigated to provide pilot control of vehicle rotational rates and accelerations. This line of inquiry is in contrast to the angle control concepts required in previous applications of these new techniques. A computer aided design package called "MULTI" is used in refining the control laws to the preliminary design stage. An aircraft model is developed in state space form for the AFTI vehicle from linearized aerodynamic data. This is accomplished at several points in the flight envelope. After validation, these models are used for the design and evaluation of the control laws. Author

N84-24532# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
DESIGN OF A COMPLETE MULTIVARIABLE DIGITAL FLIGHT CONTROL SYSTEM M.S. Thesis **c08**
Jon M. Bauschlicher *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 259-416 refs (For primary document see N84-24529 15-01)
(AFIT/GE/EE/82D-18) Avail: NTIS HC A99/MF A01 CSCL 01/3

The application of a singular perturbation method in the design of a complete (lateral and longitudinal) multivariable, error actuated, tracking, digital flight controller is examined. The aircraft model used to test the method is a hypothesized design proposed by Lockheed with augmented flight control surfaces including horizontal and vertical canards, and jet flaps. Multivariable tracker control laws can be designed for the aircraft model examined here equipped with augmented control surfaces - ailerons, rudder, maneuver flaps, canards, and jet flaps. The controllers all perform very satisfactorily at the flight condition for which they are designed.

In addition a universal controller is found that is capable of producing satisfactory responses for the three flight conditions previously mentioned, eliminating much of the gain scheduling required with present digital flight controllers. Author

N84-24533# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
DIGITAL MULTIVARIABLE TRACKER CONTROL LAWS FOR THE C-141-A STARLIFTER AIRCRAFT M.S. Thesis **c08**
Michael A. Masi *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 419-515 refs (For primary document see N84-24529 15-01)
(AFIT/GE/EE/82D-47) Avail: NTIS HC A99/MF A01 CSCL 01/3

The design of digital, multivariable tracker control laws for the C-141-A Starlifter aircraft are investigated. Controllers for the aircraft at three diverse flight conditions were developed. Additions and modifications to the computer package MULTI are included. A six degree of freedom aircraft model is developed. The equations of motion assume linearized aircraft models which make only small perturbations about each nominal flight condition. A discussion of robustness of the control laws determined is included. Digital tracker control laws are designed for this aircraft. A more accurate fully coupled aircraft model should be derived in order to further tune the control laws. MULTI, the computer design and simulation program, is available from the Air Force Institute of Technology. Author

N84-24534# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
HIGH-GAIN ERROR ACTUATED FLIGHT CONTROL SYSTEMS FOR CONTINUOUS LINEAR MULTIVARIABLE PLANTS M.S. Thesis **c08**
Thomas Lewis *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 517-573 refs (For primary document see N84-24529 15-01)
(AFIT/GAE/EE/82D-1) Avail: NTIS HC A99/MF A01 CSCL 01/3

The theory of high gain error actuated feedback control is applied to the design of various lateral directional decoupling flight control systems for an advanced aircraft. The contollers developed utilize output feedback with proportional plus integral control to produce desirable closed loop responses with minimal interactions between outputs. Because of the structure of the system, measurement variables in addition to the outputs are necessary to apply this method. Controller design robustness are examined by varying the flight conditions or maneuver commands from the ones the controller is specifically designed for, and then judges system performance. The controller is robust with respect to varying flight conditions, but is not robust with respect to varying maneuver commands. The effect of first order actuator dynamics in the system model is examined. Actuator dynamics are shown to significantly affect the control system response, indicating that a simplified model, without actuators, is not desirable in one's control design scheme. Author

N84-24535# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
RECONFIGURABLE DIGITAL CONTROL LAWS FOR THE A-7D DIGITAC 2 AIRCRAFT WITH FAILED PRIMARY CONTROL SURFACES M.S. Thesis **c08**
Daniel E. Russ *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 575-671 refs (For primary document see N84-24529 15-01)
(AFIT/GE/EE/82D-59) Avail: NTIS HC A99/MF A01 CSCL 01/3

A set of high gain, error actuated multivariable digital control laws for the A-7D DIGITAC 2 aircraft was developd at three different flight conditions and for the aircraft with three different control surface failures. Additional modifications to the computer aided design package MULTI are included. The aircraft model is based on a six degree of freedom model which contains separate left and right horizontal stabilizer and left and right aileron control surfaces. These split surfaces provide additional flexibility and permit the aircraft to perform both conventional and CCV maneuvers. The design procedure used to obtain the various tracker control laws is outlined. The presentation includes a discussion of the effects of surface failures on aircraft performance and the robustness of the controllers at other flight conditions. A proposed reconfiguration strategy is also included. Author

N84-24536# Transportation Systems Center, Cambridge, Mass.
GENERAL AVIATION ACTIVITY AND AVIONICS SURVEY Annual Summary Report
J. C. Schwenk and B. A. Rovner Dec. 1983 232 p
(AD-A139936; TSC-FAA-83-3; FAA-MS-83-5) Avail: NTIS HC A11/MF A01 CSCL 01/2

This report presents the results and a description of the 1982 General Aviation Activity and Avionics Survey. The survey was conducted during 1983 by the FAA to obtain information on the activity and avionics of the United States registered general aviation aircraft fleet, the dominant component of civil aviation in the U.S. The survey was based on a statistically selected sample of about 10.2 percent of the general aviation fleet and obtained a response rate of 68 percent. Survey results are based upon responses but are expanded upward to represent the total population. Survey results revealed that during 1982 an estimated 36.5 million hours of flying time were logged by the 209,779 active general aviation aircraft in the U.S. fleet, yielding a mean annual flight time per aircraft of 174 hours. The active aircraft represented about 82 percent of the registered general aviation fleet. The report contains breakdowns of these and other statistics by manufacturer/model group, aircraft type, state and region of based aircraft, and primary use. Also included are fuel consumption, lifetime airframe hours, avionics, and engine hours estimates. In addition, tables are included for detailed analysis of the avionics capabilities of the GA fleet. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-24537*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
UNSTEADY LAMINAR BOUNDARY-LAYER CALCULATIONS ON OSCILLATING CONFIGURATIONS INCLUDING BACKFLOW. PART 2: AIRFOIL IN HIGH-AMPLITUDE PITCHING MOTION. DYNAMIC STALL
W. Geissler Jul. 1983 58 p refs
(NASA-TM-84319-Pt-2; A-9403; NAS 1.15:84319-Pt-2) Avail: NTIS HC A04/MF A01 CSCL 01A

A previously developed finite-difference procedure for calculating unsteady, incompressible, laminar boundary layers on an oscillating flat plate is applied to a wing section undergoing high-amplitude pitching oscillations about various mean incidences. To start the entire boundary-layer calculation, appropriate initial conditions and outer boundary conditions are specified, using a stagnation-point fixed frame of reference. The breakdown of the numerical calculation procedure in the x,t-domain is interpreted to coincide with unsteady separation. Details of the boundary-layer behavior in the vicinity of separation are investigated, and a close analogy between the present results and those for a three-dimensional steady separation is found. Author

N84-24538*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AEROPROPULSIVE CHARACTERISTICS OF NON-AXISYMMETRIC-NOZZLE THRUST REVERSERS AT MACH NUMBERS FROM 0 TO 1.20
George T. Carson, Jr., Francis J. Capone, and Mary L. Mason

May 1984 126 p refs
(NASA-TP-2306; L-15724; NAS 1.60:2306) Avail: NTIS HC A07/MF A01 CSCL 01A

An investigation was conducted in the Langley 16-Foot Transonic Tunnel to determine the performance of non-axisymmetric-nozzle thrust reversers installed on a generic twin-engine fighter aircraft model. Test data were obtained at static conditions and at Mach numbers from 0.15 to 1.20 with jet exhaust simulated by high pressure air. Results showed that reverse-thrust levels of greater than 50 percent at static conditions and greater than 30 percent at in-flight conditions could be achieved. Internal reverser-port passage length was found to be very important in improving reverser performance. Increasing the reverser-port passage length improved reverse-thrust performance by as much as 28 percent at static conditions and by as much as 17 percent at Mach 1.20. Author

N84-24539*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CALCULATION OF TRANSONIC FLOW IN A LINEAR CASCADE
Leo F. Donovan 1984 13 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME
(NASA-TM-83697; E-2155; NAS 1.15:83697) Avail: NTIS HC A02/MF A01 CSCL 01A

Turbomachinery blade designs are becoming more aggressive in order to achieve higher loading and greater range. New analysis tools are required to cope with these heavily loaded blades that may operate with a thin separated region near the trailing edge on the suction surface. An existing, viscous airfoil code was adapted to cascade conditions in an attempt to provide this capability. Comparisons with recently obtained data show that calculated and experimental surface Mach numbers were in good agreement but loss coefficients and outlet air angles were not. Author

N84-24540*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NAVIER-STOKES CALCULATIONS FOR THE VORTEX OF A ROTOR IN HOVER
C. H. Liu, J. L. Thomas (NASA Langley Research Center), and C. Tung (Army Research and Technology Labs.) May 1984 11 p refs Previously announced in IAA as A83-37184
(NASA-TM-85894; A-9611; NAS 1.15:85894; USAAVSCOM-TR-4-A-3) Avail: NTIS HC A02/MF A01

An efficient finite-difference scheme for the solution of the incompressible Navier-Stokes equation is used to study the vortex wake of a rotor in hover. The solution Procedure uses a vorticity-stream function formulation and incorporates an asymptotic far-field boundary condition enabling the size of the computational domain to be reduced in comparison to other methods. The results from the present method are compared with experimental data obtained by smoke flow visualization and hot-wire measurements for several rotor blade configurations. Author

N84-24541# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abt. Flaechenflugzeuge.
FLIGHT MECHANICAL ANALYSIS OF DYNAMIC DERIVATIVES OF THE DORNIER VARIATION WIND TUNNEL MODEL
Dietrich Altenkirch Nov. 1983 119 p refs In GERMAN; ENGLISH summary Also announced as translation (ESA-TT-854)
(DFVLR-FM-83-38; ESA-TT-854) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 38

Wind-tunnel measurements with a principal fighter-type aircraft model on a dynamic balance are discussed. The principal fuselage with closed engine inlets could be combined with three wing configurations, swept back wing, rhombic wing and delta wing and additional horizontal and vertical stabilizer modifications. One more variation could be made by a strake. The aim of this investigation is measuring the influence of wing shape, stabilizer configuration and strake on the dynamic derivatives of the longitudinal and lateral motion and to compare these results with theoretical computations. This comparison made it obvious, that existing theoretical methods could not describe special physical phenomena, which occur at higher angles of attack. R.J.F.

N84-24542# Bristol Univ. (England). Dept. of Aeronautical Engineering.
WAKE VISUALIZATION B.S. Thesis
S. N. Edlund and P. D. Lucas Jun. 1983 65 p refs Original contains color illustrations
(BU-282) Avail: NTIS HC A04/MF A01

The objective of this project was to design, build and test a Wake Imaging System, based on a scheme proposed by the Boeing Aircraft Company Aerodynamic Laboratories. A pitot probe, behind which were grouped three small colored light sources, was traversed in a plane behind a wind tunnel model. The lights were lit in regions of predefined pressure loss. A long exposure photograph recorded the position of the lights, revealing total pressure contours in the wake. The Wake Imaging System was successful, resulting in a series of pictures of the flow behind three airfoils of varying planform. These yielded useful information about the extent of the wake and required much less time and computing effort than conventional methods. This report follows the progression towards the final system configuration. The effects of certain parameters are discussed, and recommendations are made for further development. Author

N84-24543# Bristol Univ. (England). Dept. of Aeronautical Engineering.
INVESTIGATION OF THE DYNAMIC PROPERTIES OF AN ELASTOMER BUSH B.S. Thesis
A. J. Gaughan and D. A. Phipps Jun. 1983 38 p ref
(BU-283) Avail: NTIS HC A03/MF A01

The dynamic properties (i.e., damping and stiffness) of an elastomer bush were investigated by using the bush to damp a pendulum. The angular displacement was measured by a rotary transducer and recorded on an ultra-violet recorder. Data necessary for writing the equation of motion at any point were produced by differentiating the displacement twice numerically. The damping and stiffness were assumed to be functions of displacement only, of the form of a sum of negative exponential terms. The coefficients of these series were found by a matri implementation of the least squares technique. Sensible results were not obtained. The mathematics of this digital technique need to be analyzed in greater detail than the time limit of this investigation has allowed, but the crux of the problem appears to be one of over constraint. Author

N84-24544# Bristol Univ. (England). Dept. of Aeronautical Engineering.
AN INVESTIGATION INTO THE NATURE AND CONTROL OF VORTEX FLOW ROUND HELICOPTER UPSWEEP B.S. Thesis
A. E. Gibson and P. F. Newrick Jun. 1983 54 p refs
(BU-285) Avail: NTIS HC A04/MF A01

The nature of the vortex flow around a helicopter fuselage with a view to flow control is examined. Tests are carried out with a specific fuselage configuration known to exhibit the flow change. Wind tunnel tests are performed on a one fifth scale model of a Westland Lynx helicopter. The effects of adding strakes, spoilers and flow deflectors to the rear fuselage are studied in order to find an optimum method of controlling the vortex flow. The strakes and spoilers had only a marginal effect. The deflector prevents the flow change from occurring, at least within the incidence range investigated, at the expense of incurring flow instability at positive helicopter incidences. M.A.C.

N84-24545# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE EFFECT OF PERFORATION ON THE AERODYNAMICS OF A SPOILER B.S. Thesis
M. L. Lange-Smith and N. Meadows Jun. 1983 61 p refs
(BU-286) Avail: NTIS HC A04/MF A01

The aerodynamic characteristics of perforated spoilers mounted on a flat plate are investigated. Various perforation patterns are tested, with the emphasis on recording the pressure response on

spoiler opening, establishing the static pressure distribution on the plate either side of the spoiler, as well as attempts at flow visualization. Measurement of the static pressures enabled the calculation of a force coefficient, which served as a measure of the influence of each spoiler on the overall pressure field. Perforation which gives a simple throughflow of air is not sufficiently effective. Significant improvements are achieved with a design for aeration of the spoiler which gives a preferred direction to the throughflow of air. The penalty in introducing perforation to a spoiler is a reduction in its spoiling effectiveness. M.A.C.

N84-24546# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE INSTABILITY OF AXISYMMETRIC SUPERSONIC JET IMPINGING ON FLAT PLATE B.S. Thesis
Y. K. Lee and P. T. Shum Jun. 1983 66 p refs
(BU-287) Avail: NTIS HC A04/MF A01

The interaction between an under-expanded supersonic jet and a flat plate with the plate located in the region in which the plate produces shock waves and flow fluctuations was investigated. A sonic nozzle was used in part one of the project to investigate the differences between results from two previous studies. Although the results of the present work differed from both of the two earlier studies, they agreed very well with theoretical predictions by the method of characteristics. A Mach 2.2 nozzle was used in the second part of the project to determine the magnitude and frequency of pressure pulsations on the plate, and the effect of an acoustic lining around the outside of the nozzle. It was found that the maximum peak-to-peak fluctuating pressure was about 1.13 of the mean plate pressure, at a separation distance of 1.5 nozzle exit diameters and a nozzle pressure ratio of 12. The acoustic lining was found to reduce the magnitude of fluctuating pressure by a factor of about one third. Author

N84-24547# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE AERODYNAMIC EFFECTS OF CAVITIES IN A BODY B.S. Thesis
A. L. Mooney and J. G. C. Powell Jun. 1983 29 p refs
(BU-289) Avail: NTIS HC A03/MF A01

The aerodynamic effects of cavities in a fuselage body were investigated. The tests were carried out for an incidence range of - 5 deg to 12 deg and for three fuselage/cavity configurations. The Reynolds number, based on model length, was 1 million. Overall force and moment coefficients were obtained which showed little change in pitching moment due to the presence of cavities, but increased in lift and drag. Pressure coefficients showed the flow in a cavity to be largely independent of the other cavities present. R.J.F.

N84-24548# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE IMPINGEMENT OF AN UNDEREXPANDED AIR JET ON SQUARE SECTION BEAMS B.S. Thesis
A. J. Truscott Jun. 1983 59 p refs
(BU-291) Avail: NTIS HC A04/MF A01

This report presents the results of an experimental study into the flow field produced by a perpendicular impingement of a supersonic air jet of nozzle exit Mach number 2.2 and underexpansion ratio 2, on uniform square section beams of section sizes ranging from 2.5 to 4.0 nozzle exit diameters. These experiments also consider the flow over a flat plate positioned at 5 nozzle exit diameters downstream of the beam. Tests were performed at nozzle exit to beam separation distances of 2 and 3 exit diameters and from the surface pressure results obtained, investigations were carried out into how the beams modify the surface pressure distribution produced by a flat plate alone under similar conditions. Also, a study was made into the flow over the other surfaces of the beams. The object of this experiment was to provide data to aid in the estimation of loads on such beams in the flow field of an underexpanded jet. Author

N84-24549# Bristol Univ. (England). Dept. of Aeronautical Engineering.
AN INVESTIGATION INTO ANTI-SWIRL DEVICES FOR S-SHAPED AIR INTAKES B.S. Thesis
L. D. Bacon and J. M. Magowan Jun. 1983 49 p refs
(BU-293) Avail: NTIS HC A03/MF A01

The paper presents the results of an investigation into the effectiveness of streamwise fences as anti-swirl devices for use in an S-shaped duct of typical air intake proportions. Fences were positioded in the first bend of the duct on the lower and outside walls. The effects of twelve configurations of such fences of varying heights have been studied. The swirl characteristics over an incidence range of 10 deg to 30 deg were measured in terms of swirl coefficient (SC sub 60), distortion coefficient (DC sub 60) and pressure recovery. In addition static pressures at the wall were measured either side of the fences. It was found that all fence configurations tested improved the swirl characteristics of the duct (by arresting rotational flow in the first bend), and indeed the swirl direction could be reversed. The configuration consisting of a lower and side fence meeting on the center-line of the duct was found to possess the most favorable characteristics of the configurations tested. B.W.

N84-24550# Bristol Univ. (England). Dept. of Aeronautical Engineering.
DEMONSTRATION OF BOUNDARY LAYER CHARACTERISTICS B.S. Thesis
N. Thomas and A. LaGuardia Jun. 1983 55 p refs
(BU-299) Avail: NTIS HC A04/MF A01

The investigation aimed to improve a demonstration of boundary layer characteristics. The demonstration was redesigned to suit the department's 60 cm x 80 cm low turbulence wind tunnel and the boundary layer was grown on a pivoted splitter board. This allowed the effect of different pressure gradients on boundary layers to be demonstrated. The velocity measurements were made using both pitot probes and hot-wire anemometers. The acquisition of data from the hot-wire anemometer was automated by using a microcomputer system which controlled a stepper motor driven traversing mechanism. The microcomputer also enabled an improved presentation of the data. Most discrepancies between the measured and analytical profiles were due to leading edge effects of the board which did not give a constant pressure gradient. Inaccurate anemometer readings were obtained in regions of very high relative turbulence. R.J.F.

N84-24551# Bristol Univ. (England). Dept. of Aeronautical Engineering.
A CIRCULATION METER FOR THE MEASUREMENT OF DISCRETE VORTICES B.S. Thesis
L. W. Mollan and C. A. Wren Jun. 1983 39 p refs
(BU-300) Avail: NTIS HC A03/MF A01

An instrument was designed and tested to locate, and to measure, the circulation in a discrete vortex. The circulation meter consists of three Conrad type yawmeters, with the facility for radial movement, positioned equally, at 120 deg separation, around a central sphere-static probe. This instrument was shown to produce accurate and consistent results when measuring vortices in low speed flow. R.J.F.

N84-24552# Oxford Univ. (England). Wind Engineering Research Group.
WIND TUNNEL MODELLING OF BUOYANT PLUMES
K. W. Rutledge Jan. 1984 249 p refs
(QUEL-1513/84) Avail: NTIS HC A11/MF A01

Wind tunnel studies are considered to be the most suitable method for studying near field dispersion, and methods for accurately modelling the nearfield behavior of a buoyant plume of gas are examined. The mean trajectory and rate of spread of a buoyant plume from a 60 m high (full-scale) stack are measured in the presence of a simulated natural wind. The exact similarity requirements are derived from dimensional analysis and from the equations of motion. The effect of the cross flow on near field dispersion is examined by performing experiments in four different

simulations of the Earth's atmospheric boundary layer. The behavior of the plumes is insensitive to the turbulence of the cross flow provided the turbulence intensity was of a level characteristic of atmospheric winds. A more critical influence is the velocity profile which should be an accurate simulation of the natural wind profile. M.A.C.

N84-24553# Glasgow Univ. (Scotland). Faculty of Engineering.
AN ALGORITHM FOR THE PREDICTION OF UNSTEADY POTENTIAL FLOW ABOUT AN ARBITRARY AEROFOIL
M. Vezza and R. A. McD. Galbraith Oct. 1983 36 p refs
(GU-AERO-8306) Avail: NTIS HC A03/MF A01

A new model is presented for the calculation of the incompressible, inviscid flow around an arbitrary aerofoil undergoing unsteady motion. The numerical algorithm was developed from the steady flow model of Leishman and Galbraith, in which use was made of a linear distribution of panel vorticity, and also using a technique similar to that proposed by Basu and Hancock. A brief history of unsteady flow modelling is given in the introduction, followed by the mathematical details of the current method. Results are presented and discussed for a number of cases which clearly illustrate certain characteristics of unsteady flow. Author

N84-24554# Glasgow Univ. (Scotland). Faculty of Engineering.
AN INVESTIGATION OF THREE-DIMENSIONAL STALL DEVELOPMENT ON NACA 23012 AND NACA 0012 AEROFOILS
L. Y. Seto, J. G. Leishmann, and R. A. M. Galbraith Jan. 1983 30 p refs
(Contracts SERC-E.3131; MOD-2048/026XR/STR)
(GU-AERO-8300) Avail: NTIS HC A03/MF A01

Two airfoil sections, NACA 23012 and NACA 0012 were tested, one (23012) in a subsonic wind tunnel and the other (0012) in a 0.84 m x 1.14 m low speed wind tunnel. Both sections are problematic in respect of their stalling characteristics as they lie on the boundary between two types. Over a range of Reynolds number, the airfoil might have a trailing edge with a gradual forward movement of the point of separation as incidence is increased, or, at some higher Reynolds number, it may exhibit a combined leading and trailing edge type stall. For the latter case the airfoil starts to stall with evident turbulent boundary layer separation moving forward from the trailing edge and the flow breakdown being completed by the bursting of the laminar separation bubble; i.e., the laminar separation of the flow in the leading edge region failing to reattach after transition of the free shear layer to a turbulent one. R.J.F.

N84-24555# Societe Nationale Industrielle Aerospatiale, Toulouse (France).
A VECTORIZED FINITE ELEMENT METHOD FOR COMPUTATION OF TRANSONIC TRIDIMENSIONAL POTENTIAL FLOWS
O. Brocard (ONERA, Toulouse), C. Bonnet, Y. Vigneron, T. Lejal, and J. Usquet 23 Feb. 1984 8 p refs In FRENCH Presented at AFCET/GAMNI/ISINA Conf., Paris, 18 Mar. 1983
(Contract DRET-81-34-662-00-470-75-01)
(SNIAS-832-111-105) Avail: NTIS HC A02/MF A01

A calculation method is presented for simulating aerodynamic flow around complex shapes of transonic, civil transport aircraft. The vectorization of this method is described for the CYBER 205 and the CRAY-1. Model performance is obtained by computer. Transl. by M.A.C.

N84-24556# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
AIRBUS A-310. TESTS IN THE ONERA'S F1 WIND TUNNEL: COMPARISON OF FLIGHT/WIND TUNNEL [AIRBUS A-310. ESSAIS DANS LA SOUFFLERIE F1 DE L'ONERA: COMPARISON VOL/SOUFFLERIE]
M. Saiz and C. Quemard (ONERA) 23 Feb. 1984 24 p refs In FRENCH; ENGLISH summary Presented at AGARD Fluid Dyn. Panel Conf., Izmir, Turkey, 26 - 29 Sep. 1983
(SNIAS-832-111-110) Avail: NTIS HC A02/MF A01

It is explained how and through what means the measurements made in the F1 wind tunnel were carried out on the model at 1/14 scale of the A 310. It is shown how these measurements were subjected to a comparison with flight test results. R.J.F.

N84-24557# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
STUDY OF AEROSPACE MATERIALS, COATINGS, ADHESIONS AND PROCESSES. AIRCRAFT ICING PROCESSES Final Scientific Report, 15 Jul. 1982 - 14 Sep. 1983
E. M. Rodriguez 14 Sep. 1983 182 p
(Grant AF-AFOSR-0316-82; AF Proj. 2301)
(AD-A139743; EOARD-TR-84-11-1) Avail: NTIS HC A09/MF A01 CSCL 01/4

INTA has been provided with a versatile and powerful FORTRAN Program that permits a full analysis of the trajectories described by the droplets of a cloud with respect to an infinitely long cylinder moving inside it normally to its longitudinal axis. Author (GRA)

N84-24558# Catholic Univ. of America, Washington, D.C. School of Engineering and Architecture.
EXPERIMENTAL INVESTIGATION OF THE TURBULENT LARGE SCALE TEMPORAL FLOW IN THE WING-BODY JUNCTION Ph.D. Thesis
E. P. Rood, Jr. Mar. 1984 271 p
(RR02301)
(AD-A139836; DTNSRDC-HA84-1) Avail: NTIS HC A12/MF A01 CSCL 20/4

An experimental investigation of the fluid dynamic flow in the wing-body junction was made to reveal the existence of large scale, time-dependent structures. These temporal features are discussed relative to the three major parts of the mean flow: the onset boundary layer, the wing-body junction flow characterized by the horseshoe root vortex, and the wing-body junction wake flow. Distinct flow structures, distinguished by bandwidths, were observed in all parts of the flow. One type of structure was due to the distortion of the existing structure of the onset boundary layer by the wing. A second and a third structure were newly created in the flow by the presence of the wing. These unique structures along the body were boundary layer phenomena, clearly distinguishable from ordinary Strouhal-type shedding at the wing trailing edge. The measurements distinguishing the structures were made using applications of two-point spectral correlation analyses of the flow velocities. The application of this established procedure was made possible by modern high speed data techniques. An orderly framework of definitions and discussion is presented around which additional research can be performed to discover the details of the flow structure. Author (GRA)

N84-24559# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THE STUDY OF AN IDEALIZED WING/BODY JUNCTION Final Scientific Report, 30 Apr. 1983 - 31 Jan. 1984
Greg Stringfield 31 Mar. 1984 61 p
(Grant AF-AFOSR-0127-83; AF Proj. 2301)
(AD-A139933; VKI-PR-1983-28; EOARD-TR-84-13) Avail: NTIS HC A04/MF A01 CSCL 20/4

An experimental study was performed to determine the influence of fairings on the reduction of drag which is produced by the wing-body junction. The wing-body junction was represented by a wing mounted on a flat plate and the junction was contoured by placing different fairing sizes at the wing leading edge and wing trailing edge. The purpose of the experiment was to observe the effect of the different fairing sizes on the wing-body junction aerodynamics. Author (GRA)

N84-24560# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
THE EFFECT OF STRAKES ON VORTICAL FLOWS APPLIED TO AIRCRAFT Final Scientific Report, 30 Apr. 1983 - 31 Jan. 1984
G. G. Ordonez 31 Mar. 1984 185 p
(Grant AF-AFOSR-0126-83; AF Proj. 2301)
(AD-A139989; VKI-PR-1983-22; EOARD-TR-84-14) Avail: NTIS

HC A09/MF A01 CSCL 20/4

The influence of strakes placed along vortical flows has been determined in order to define ways of drag reduction on wake-like flow fields present on aircraft afterbodies. Strakes of different aspect ratio and thickness were tested at different angles of incidence with respect to a vortex path in order to evaluate the best configuration which can reduce, or minimize, the cross flow kinetic energy, thus the vortex drag of a vortical flow. The flow field in the vicinity of the boattail of a scale cargo aircraft was studied. The aircraft was tested with and without strakes placed on its afterbody, the results confirm that when strakes are properly placed on the boattail, a reduction in drag is achievable.

Author (GRA)

N84-24561# Massachusetts Inst. of Tech., Cambridge. Gas Turbine Plasma Dynamics Lab.

ON THE STABILITY OF FLIGHT VEHICLES IN THE LOW REYNOLDS NUMBER NON-LINEAR REGIME Final Report

E. E. Covert, O. W. K. Lee, and C. M. Vaczy Feb. 1984 4 p

(Contract N00014-82-K-0310)

(AD-A140008) Avail: NTIS HC A02/MF A01 CSCL 20/4

The first part consists of a literature survey in external fluid mechanics, (i.e., flow over wings and bodies) in the Reynolds number range of 20,000 to 200,000. The second part was a technical review of the material presented at Low Reynolds Number Flow. The third part was a trajectory study for a vehicle flying in the low Reynolds number regime. The trajectory study was initiated as a means of accessing the stability of a vehicle flying under circumstances where: (1) the aerodynamic characteristics are non-linear, and (2) there is coupling between lateral motion (which can induced local stalling) and pitching motion. It is found that for the case studied a modified from of the Liapunov Stability Criteria using a phase-plane, provided a suitable description of the motion. The unstable lateral motion of the vehicle chosen for analysis is shown. The instability is indicated by steady growth of the curve away from any particular point shown on the plane. This work is incomplete in that time did not permit study of reverse interesting features; like the effect of lift curves hysteresis on the motion.

GRA

N84-24562# California Univ., Livermore. Lawrence Livermore Lab. Systems, Microwave Measurements and Effects Group.

F-14 SCALE MODEL MEASUREMENTS. PART 1: EXTERNAL RESPONSE

H. G. Hudson and D. M. Wythe Jul. 1983 277 p refs Sponsored in part by Defense Nuclear Agency

(Contract W-7405-eng-48)

(DE84-008201; AD-B081776; UCID-19944-Pt-1) Avail: NTIS HC A13/MF A01

This report documents the work accomplished on the scale model F-14 (referred to hereafter as the model) aircraft and only includes measurements taken to data on the external portions of the model. These measurements are intended to simulate the measurements taken on a full scale F-14 aircraft (referred to hereafter as the F-14) at the Air Force Weapons Laboratory (AFWL). The model was tested in eight different configurations of wing position and field incidence. The various model configurations are detailed for which data were taken. All data are presented and include the impulse responses and their Fourier transforms, the estimated model responses to the incident fields of the AFWL Vertically Polarized Dipole (VPD) and the AFWL Horizontally Polarized Dipole (HPD) simulators compared with the F-14 measurements taken at these simulators and a comparison of our transfer functions with CW measurements taken at the same points at the University of Michigans' anechoic measurement facility.

DOE

N84-24563# Sandia Labs., Albuquerque, N. Mex. Aerodynamics Dept.

IMPROVED PREDICTION OF PARACHUTE LINE SAIL DURING LINES-FIRST DEPLOYMENT

James W. Purvis Apr. 1984 10 p refs Presented at the 8th AIAA Aerodyn. Declerator and Balloon Technol. Conf., Hyannis, Mass., 2 Apr. 1984

(Contract DE-AC04-76DP-00789)

(DE84-007340; SAND-84-0348C; CONF-840496-9) Avail: NTIS HC A02/MF A01

A numerical deployment simulation with the capability to predict line sail is presented. A finite element approach is used in which both canopy and suspension lines are modeled as flexible, distributed-mass structures connected to a finite-mass forebody. Translation and rotation of both the forebody and the deployment bag are determined from three-degree-of-freedom flight mechanics equations. The model includes all aspects of the deployment problem, such as suspension line aerodynamics, line ties, and canopy/deployment bag friction. The model was verified by comparison with experimental data and used to investigate proposed solutions for a system with a line sail problem. DOE

N84-24902# Ballistic Research Labs., Aberdeen Proving Ground, Md.

RESPONSE OF STRUCTURAL PANELS TO AIR BLAST Abstract Only

Norris J. Huffington, Jr. and Henry L. Wisniewski *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1984 p 191 (For primary document see N84-24833 15-01)

Avail: NTIS HC A16/MF A01 CSCL 01A

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-24564# Naval Postgraduate School, Monterey, Calif.

SYSTEM SAFETY AND THE COAST GUARD LIGHTER-THAN-AIR SYSTEM PROJECT M.S. Thesis

P. J. Danaher Dec. 1983 85 p

(AD-A139807) Avail: NTIS HC A05/MF A01 CSCL 13/12

The Coast Guard is evaluating the potential of Lighter-Than-air (LTA) vehicles for possible future Coast Guard utilization. Progress of the project is explored. Safety science is an emerging field particularly of value in the historically hazardous realm of aviation. The System Safety Concept as applicable to major project development is examined. One of the fundamental tasks of system safety management is to identify possible hazards early in the conceptual phase of product development. If the concept is not without historical precedence, part of this task is accomplished by examining historical safety records to identify potential hazards. To this end, records of Navy LTA mishaps are examined and comparisons are made to Coast Guard aircraft mishap records.

Author (GRA)

N84-24565# Naval Weapons Center, China Lake, Calif.

AIRCREW GLIDING ESCAPE SYSTEM (AGES) EXPLORATORY DEVELOPMENT INVESTIGATION OF AIRCREW EMERGENCY ESCAPE RAM-AIR INFLATED, FLEXIBLE WING Summary Report, Aug. 1975 - Jun. 1983

J. T. Matsuo and M. C. Jr. Butler Sep. 1983 38 p

(F41-451)

(AD-A139928; AD-E900306; NWC-TP-6098) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report describes the research, development, fabrication, and testing of the AGES ram-air inflated parachute wings. The primary focus of the investigation to date was on high-airspeed tests in order to obtain data on the structural integrity of the parachute wing and reefing system design and performance. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-24566*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

DEVELOPMENT AND FLIGHT TEST OF A HELICOPTER COMPACT, PORTABLE, PRECISION LANDING SYSTEM CONCEPT

George R. Clary, John S. Bull, Thomas J. Davis, and John P. Chisholm (Sierra Nevada Corp.) Apr. 1984 11 p refs

(NASA-TM-85951; A-9729; NAS 1.15:85951) Avail: NTIS HC A02/MF A01 CSCL 17G

An airborne, radar-based, precision approach concept is being developed and flight tested as a part of NASA's Rotorcraft All-Weather Operations Research Program. A transponder-based beacon landing system (BLS) applying state-of-the-art X-band radar technology and digital processing techniques, was built and is being flight tested to demonstrate the concept feasibility. The BLS airborne hardware consists of an add-on microprocessor, installed in conjunction with the aircraft weather/mapping radar, which analyzes the radar beacon receiver returns and determines range, localizer deviation, and glide-slope deviation. The ground station is an inexpensive, portable unit which can be quickly deployed at a landing site. Results from the flight test program show that the BLS concept has a significant potential for providing rotorcraft with low-cost, precision instrument approach capability in remote areas. Author

N84-24567*# Boeing Commercial Airplane Co., Seattle, Wash.

MLS/AIRPLANE SYSTEM DESIGN. RF COMPONENT DESIGN Final Report

D. B. Walen and B. P. Stapleton Jun. 1984 23 p refs

(Contract NAS1-16300)

(NASA-CR-172339; NAS 1.26:172339; D6-51280) Avail: NTIS HC A02/MF A01 CSCL 17G

Results of analysis and design conducted as part of multiyear Microwave Landing System (MLS) study are reported. Design of airborne radio frequency RF MLS components was performed. MLS omnidirectional antennas are developed using microstrip technology. A remote, low-noise, radio frequency (RF) preamplifier is designed for airborne MLS installations. M.A.C.

N84-24568# Systems Control Technology, Inc., West Palm Beach, Fla.

CONUS LORAN-C ERROR BUDGET: FLIGHT TEST Final Report

L. D. King, E. D. McConkey, and K. J. Venezia Dec. 1983 127 p

(Contract DTFA01-83-C-20041)

(AD-A139871; FAA-PM-83-32) Avail: NTIS HC A07/MF A01 CSCL 17/7

This report contains the description and results of a Loran-C flight test program conducted in the continental United States (CONUS). The data collection period was during July 1983. The purpose of the program was to collect Loran-C signal coverage and accuracy data representative of low altitude, low speed operations typical of helicopters and general aviation aircraft. The test aircraft use a Beechcraft Queen Air, Model 65. The aircraft was configured with a data collection palate and multipin electrical connectors located in the aircraft cabin. A Teledyne TDL-711 navigation receiver was used in the test, utilizing an E-field antenna mounted on the top of the fuselage. A microprocessor controlled data collection system, utilizing a scanning DME and other aircraft navigation instruments, was used to record data and establish aircraft reference position. Route segments, totaling over 9500 nm covering much of CONUS, were flown during the project. Data were recorded on all route segments. Over 12,000 data points were used in the accuracy analysis. Calibration procedures, used at five locations, reduced errors throughout an area within a 75 nm radius of the calibration point. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-24569 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).

ESTIMATION OF THE FLIGHT PARAMETERS OF LOW FLYING AIRCRAFT USING THE RADIATED NOISE Thesis - Hochschule der Bundeswehr

J. Schiller Sep. 1983 157 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium der Verteidigung

(Lfd-211; Rept-4-83) Copyright. Avail: Issuing Activity

The use of acoustic sensors might make it possible to close the RADAR detection gap for low flying aircraft. Measurements made using one single sensor are presented. Variances in bearing angle are given and compared with computer simulation results. Two methods for estimating the dynamic flight parameters of inertially moving targets on the basis of single sensor measurements are developed and tested with real data. It is shown, that in the case of targets at high speed the retardation effect can be used for parameter estimation. Author

N84-24570# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.

SYSTEM MODELING AND IDENTIFICATION OF EQUIVALENT SYSTEMS WITH AND WITHOUT COMPENSATING TIME DELAY FOR CONTROL-AUGMENTED AIRCRAFT

Jean Skudridakis Nov. 1983 106 p refs In GERMAN; ENGLISH summary Also announced as translation (ESA-TT-852)

(DFVLR-FB-83-36; ESA-TT-852) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 34

The identification of the aerodynamic and equivalent derivatives in the longitudinal and lateral motions of modern fighter aircraft is described. The goal of the investigation was, in particular, the determination of handling qualities parameters through reduced evaluation methods in order to fulfill the requirements of the MIL-F-8785 C calculation. To accomplish this goal, the highly complex method of observing aircraft motion was reduced by means of goal-oriented simplifications to a lower order system. The report describes the mathematical modelling for various control inputs with and without compensating time-delay, their influence on the results and their accuracy. Author

N84-24571# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Wolkenphysik.

FIRST STAGE OF EQUIPMENT FOR AIRCRAFT DO 28 OF DFVLR AS A RESEARCH AIRCRAFT FOR ICING AND FIRST RESEARCH RESULTS

Hans-Eberhard Hoffman and Johann Demmel Nov. 1983 65 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-855)

(DFVLR-FB-83-40) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 22,50

The first stage of equipment of a Do 28 of DFVLR as a research aircraft for icing has been finished. These measurements can be made: Liquid water content (2 types of devices), temperature, rel. humidity, backscatter coefficient, ice accretion (on three different standard cylinders). During first flights in February and March 1983 the measurements resulted among other things in: The thickness of ice accretion on the standard cylinders increased linear with liquid water content between 0,06 and 0,30 g/sq m LWC; the ice accretion was the more intensive the thinner the

cylinder was; when the temperature was only some degrees lower, the ice accretion was significant thicker; two different types of devices for measuring LWC resulted in good consistency. Author

N84-24572# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
THE USE OF ARALL IN FUSELAGE SKINS
J. B. DeJonge 20 Aug. 1982 28 p refs
(Contract NIVR-1950)
(AD-B080831; NLR-TR-82061-U) Avail: NTIS HC A03/MF A01

A general review of the loading of transport aircraft fuselages is given as well as the consequent fuselage skin stresses. Taking the F-28 fuselage as an example, the potential weight savings that can be obtained by using aramide reinforced aluminum laminate as skin material, are assessed. R.J.F.

N84-24573# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE INFLUENCE OF A MOVING SUSPENSION ON THE BEHAVIOUR OF MODELLED HELICOPTER UNDERSLUNG LOADS B.S. Thesis
J. D. Lesser and G. J. Walker Jun. 1983 91 p refs
(BU-288) Avail: NTIS HC A05/MF A01

The influence of a moving suspension on the behavior of helicopter underslung loads was investigated both experimentally and analytically. Experimental modelling was achieved using a double pendulum arrangement incorporating three mutually perpendicular translational support stiffnesses. Both experimentally and analytically, the influence of suspension point characteristics on the behavior of the load was shown to be radical. Generic classification of this non-linear system enabled the predominant behavioral features to be isolated. Author

N84-24574# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE STRUCTURAL AND AERODYNAMIC BEHAVIOUR OF A SEMI-INFLATABLE WING B.S. Thesis
M. J. Hopkinson and A. S. Hannheim Jun. 1983 44 p ref
Original contains color illustrations
(BU-297) Avail: NTIS HC A03/MF A01

The viability of a semi-inflatable aerofoil structure to be used as a collapsible wing on a small Remotely Piloted Vehicle (RPV) is investigated. A prototype is tested in an open jet wind tunnel both from an aerodynamic and a structural point of view. As first tested, the form of construction was found to be inadequate. The aerofoil, in its final form, was found to be suitable for the RPV application, although improvement in the basic design could reduce the overall weight of the structure, and the internal pressure required. M.A.C.

N84-24575# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
STATISTICAL APPROACH TO DAMAGE TOLERANCE ASSESSMENT
J. M. Thomas, B. Lachaud, C. Laurent, and J. M. Leonard 23 Feb. 1984 17 p Presented at 12th ICAF Conf., Toulouse, 25-27 May 1983
(SNIAS-832-111-112) Avail: NTIS HC A02/MF A01

Civil transport aircraft fatigue strength is a very arduous problem, considering the complexity of aircraft, the diversity of their missions and airline operation and the present state of science in this field. In order to take the influence of parameters such weight, flight frequency, mission characteristics and the stress level associated with the structural design into account in a global approach, and with a view to customizing fatigue predictions for the type of operation of each commercial airline, an extensive statistical fatigue methodology was developed. This fully computerized methodology associates on one hand a parametric phase enabling an aircraft and its operation to be customized by mean of two data bases: the parametric stress data base and the disturbance statistics data base, and on the other a statistical fatigue analysis based on a representation of the stress spectrum as a stress/frequency diagram. The analysis uses a rain flow type method extended to the statistical aspect and clearly highlights the contribution of the ground-air-ground cycle. R.J.F.

N84-24576# Air Force Flight Test Center, Edwards AFB, Calif.
ELECTRICAL SUBSYSTEMS FLIGHT TEST HANDBOOK Final Report, Jun. 1983 - Jan. 1984
K. J. Lush Jan. 1984 104 p
(AD-A139783; AFFTC-TIH-84-1) Avail: NTIS HC A06/MF A01 CSCL 01/3

This Handbook provides engineers with guidelines for the testing of aircraft electrical subsystems. Future technological advances, characteristics of individual aircraft and test programs and cost constraints may necessitate other methods being used in some cases. A background is provided on aircraft electrical subsystems and the requirements to which they are designed. Details are provided of individual tests, test support requirements and evaluation criteria and suggestions made for presentation of results. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-24577* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTOR LINER CONSTRUCTION Patent
Harold M. Craig (United Technologies Corp., East Hartford, Conn.), Walter B. Wagner (United Technologies Corp., East Hartford, Conn.), and William J. Strock, inventors (to NASA) (United Technologies Corp., East Hartford, Conn.) Issued 15 Nov. 1983 6 p Filed 2 Apr. 1980 Sponsored by NASA
(NASA-Case-LEW-14035-1; US-Patent-4,414,816; US-Patent-Appl-SN-136652; US-Patent-Class-60-757) Avail: US Patent and Trademark Office CSCL 21E

A combustor liner is fabricated from a plurality of individual segments each containing counter/parallel Finwall material and are arranged circumferentially and axially to define the combustion zone. Each segment is supported by a hook and ring construction to an opened lattice frame with sufficient tolerance between the hook and ring to permit thermal expansion with a minimum of induced stresses.

Official Gazette of the U.S. Patent and Trademark Office

N84-24578*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LEWIS RESEARCH CENTER SPIN RIG AND ITS USE IN VIBRATION ANALYSIS OF ROTATING SYSTEMS
Gerald V. Brown, Robert E. Kielb, Erwin H. Meyn, Richard E. Morris, and Stephen J. Posta May 1984 19 p refs
(NASA-TP-2304; E-1829; NAS 1.60:2304) Avail: NTIS HC A02/MF A01 CSCL 21E

The Lewis Research Center spin rig was constructed to provide experimental evaluation of analysis methods developed

under the NASA Engine Structural Dynamics Program. Rotors up to 51 cm (20 in.) in diameter can be spun to 16,000 rpm in vacuum by an air motor. Vibration forcing functions are provided by shakers that apply oscillatory axial forces or transverse moments to the shaft, by a natural whirling of the shaft, and by an air jet. Blade vibration is detected by strain gages and optical blade-tip motion sensors. A variety of analogy and digital processing equipment is used to display and analyze the signals. Results obtained from two rotors are discussed. A 56-blade compressor disk was used to check proper operation of the entire spin rig system. A special two-blade rotor was designed and used to hold flat and twisted plates at various setting and sweep angles. Accurate Southwell coefficients have been obtained for several modes of a flat plate oriented parallel to the plane of rotation.
Author

N84-24579*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TANDEM FAN APPLICATIONS IN ADVANCED STOVL FIGHTER CONFIGURATIONS
Charles L. Zolar, Samuel B. Wilson, III, and Megan A. Eskey 1984 20 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984
(NASA-TM-83689; E-2140; NAS 1.15:83689) Avail: NTIS HC A02/MF A01 CSCL 21E

The series/parallel tandem fan engine is evaluated for application in advanced STOVL supersonic fighter aircraft. Options in engine cycle parameters and design of the front fan flow diverter are examined for their effects on engine weight, dimensions, and other factors in integration of the engine with the aircraft. Operation of the engine in high-bypass flow mode during cruise and loiter flight is considered as a means of minimizizng fuel consumption. Engine thrust augmentation by burning in the front fan exhaust is discussed. Achievement of very sort takeoff with vectored thrust in briefly reviewed for tandem fan engine configurations with vectorable front fan nozzles. Examples are given of two aircraft configuration planforms, a delta-canard, and a forward-swept wing, to illustrate the major features. design considerations, and potential performance of the tandem fan installation in each. Full realization of the advantages of tandem fan propulsion are found to depend on careful selection of the aircraft configuration, since integration requirements can strongly influence the engine performance.
Author

N84-24580*# General Electric Co., Lynn, Mass. Aircraft Business Group.
ROTORCRAFT CONTINGENCY POWER STUDY Final Report
Robert Hirschkron, John F. Haynes, David N. Goldstein, and Richard H. Davis May 1984 157 p refs
(Contract NAS3-23705)
(NASA-CR-174675; NAS 1.26:174675; R84AEB012) Avail: NTIS HC A08/MF A01 CSCL 21E

Twin helicopter engines are often sized by the power requirement of a safe mission completion after the failure of one of the two engines. This study was undertaken for NASA Lewis by General Electric Co. to evaluate the merits of special design features to provide a 2-1/2 Contingency Power rating, permitting an engine size reduction. The merits of water injection, turbine cooling airflow modulation, throttle push, and a propellant auxiliary power plant were evaluated using military Life Cycle Cost (LCC) and commercial helicopter Direct Operating Cost (DOC) merit factors in a rubber engine and a rubber aircraft scenario.
Author

N84-24581*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPERSONIC STOVL EJECTOR AIRCRAFT FROM A PROPULSION POINT OF VIEW
Roger W. Luidens, R. Plencner, W. Haller, and A. Glassman 1984 18 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME
(NASA-TM-83641; E-2084; NAS 1.15:83641) Avail: NTIS HC A02/MF A01 CSCL 21E

A baseline supersonic STOVL ejector aircraft, its propulsion and typical operating modes is described, and important propulsion parameters are identified. Then a number of propulsion system changes are evaluated for improvement of the lift-off performance aft deflection of the ejector jet and heating of the ejector primary air either by burning or using the hot engine core flow. The possibility for cooling the footprint is illustrated for mixing or interchanging the fan and core flows, and in use of a core flow ejector. The application of a new engine concept the turbine bypass engine plus a turbocompressor to supply the ejector primary air, and thrust during takeoff combat are presented.
E.A.K.

N84-24582*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SUPERSONIC STOVL AIRCRAFT WITH TURBINE BYPASS/ TURBO-COMPRESSOR ENGINES
Leo C. Franciscus and Roger W. Luidens 1984 15 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME
(NASA-TM-83686; E-2138; NAS 1.15:83686) Avail: NTIS HC A02/MF A01 CSCL 21E

Three propulsion systems for a Mach 2 STOVL fighter were compared. The three propulsion systems are: (1) turbine bypass engine with a turbocompressor used for STOVL only; (2) turbine bypass engine with a turbocompressor for both STOVL and thrust during forward flight; and (3) mixed flow afterburning turbofan with a remote burner lift system. In the first system, the main engines have afterburners and the turbocompressors use after burning during STOVL. In the second system, the turbine bypass engines are dry and the turbocompressors have afterburners. The mission used in the study is a deck launched intercept mission. It is indicated that large improvements in combat time are possible when the turbocompressors are used for both left and thrust for forward flight.
E.A.K.

N84-24583*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN OVERVIEW OF NASA INTERMITTENT COMBUSTION ENGINE RESEARCH
Edward A. Willis and William T. Wintucky 1984 33 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME
(NASA-TM-83668; E-2111; NAS 1.15:83668) Avail: NTIS HC A03/MF A01 CSCL 21E

This paper overviews the current program, whose objective is to establish the generic technology base for advanced aircraft I.C. engines of the early 1990's and beyond. The major emphasis of this paper is on development of the past two years. Past studies and ongoing confirmatory experimental efforts are reviewed, which show unexpectly high potential when modern aerospace technologies are applied to inherently compact and balanced I.C. engine configurations. Currently, the program is focussed on two engine concepts the stratified-charge, multi-fuel rotary, and the lightweight two-stroke diesel. A review is given of contracted and planned high performance one-rotor and one-cylinder test engine work addressing several levels of technology. Also reviewed are basic supporting efforts, e.g., the development and experimental validation of computerized airflow and combustion process models, being performed in-house at Lewis Research Center and by university grants.
Author

N84-24584*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTION GAS PROPERTIES OF VARIOUS FUELS OF INTEREST TO GAS TURBINE ENGINEERS
Robert E. Jones, Arthur M. Trout, and Jerrold D. Wear 1984 11 p refs Presented at the Joint Power Generation Conf., Toronto, 1-4 Oct. 1984; sponsored by ASME
(NASA-TM-83682; E-2133; NAS 1.15:83682) Avail: NTIS HC A02/MF A01 CSCL 21E

A series of computations were made using the gas property computational schemes of Gordon and McBride to compute the gas properties and species concentration of ASTM-Jet A and dry air. The computed gas thermodynamic properties in a revised

graphical format which gives information which is useful to combustion engineers is presented. A series of reports covering the properties of many fuel and air combinations will be published. The graphical presentation displays on one chart of the output of hundreds of computer sheets. The reports will contain microfiche cards, from which complete tables and graphs can be obtained. The extent of the planned effort and is documented samples of the many tables and charts that will be available on the microfiche cards are presented. E.A.K.

N84-24585*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SENSOR FAILURE DETECTION FOR JET ENGINES USING ANALYTICAL REDUNDANCE

Walter C. Merrill 1984 24 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME

(NASA-TM-83695; E-2123; NAS 1.15:83695; AIAA-84-1452) Avail: NTIS HC A02/MF A01 CSCL 21E

Analytical redundant sensor failure detection, isolation and accommodation techniques for gas turbine engines are surveyed. Both the theoretical technology base and demonstrated concepts are discussed. Also included is a discussion of current technology needs and ongoing Government sponsored programs to meet those needs. Author

N84-24586*# Massachusetts Inst. of Tech., Cambridge. Gas Turbine and Plasma Dynamics Lab.

FLUTTER AND FORCED RESPONSE OF MISTUNED ROTORS USING STANDING WAVE ANALYSIS

David J. Bundas and John Dungundji Mar. 1983 155 p refs Previously announced as A83-29823

(Grant NAG3-214)

(NASA-CR-173555; NAS 1.26:173555; GT/PDL-170) Avail: NTIS HC A08/MF A01 CSCL 21E

A standing wave approach is applied to the analysis of the flutter and forced response of tuned and mistuned rotors. The traditional traveling wave cascade airforces are recast into standing wave arbitrary motion form using Pade approximants, and the resulting equations of motion are written in the matrix form. Applications for vibration modes, flutter, and forced response are discussed. It is noted that the standing wave methods may prove to be more versatile for dealing with certain applications, such as coupling flutter with forced response and dynamic shaft problems, transient impulses on the rotor, low-order engine excitation, bearing motion, and mistuning effects in rotors. V.L. (IAA)

N84-24587*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HIGHLY INTEGRATED DIGITAL ENGINE CONTROL SYSTEM ON AN F-15 AIRPLANE Final Report

Frank W. Burcham, Jr. and Edward A. Haering, Jr. Jun. 1984 13 p refs Presented at the 20th AIAA/ASME/SAE Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984

(NASA-TM-86040; H-1240; NAS 1.15:86040) Avail: NTIS HC A02/MF A01 CSCL 21E

The Highly Integrated Digital Electronic Control (HIDEC) program will demonstrate and evaluate the improvements in performance and mission effectiveness that result from integrated engine/airframe control systems. This system is being used on the F-15 airplane. An integrated flightpath management mode and an integrated adaptive engine stall margin mode are implemented into the system. The adaptive stall margin mode is a highly integrated mode in which the airplane flight conditions, the resulting inlet distortion, and the engine stall margin are continuously computed; the excess stall margin is used to uptrim the engine for more thrust. The integrated flightpath management mode optimizes the flightpath and throttle setting to reach a desired flight condition. The increase in thrust and the improvement in airplane performance is discussed. M.A.C.

N84-24588*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PRELIMINARY FLIGHT TEST RESULTS OF THE F100 EMD ENGINE IN AN F-15 AIRPLANE Final Report

Lawrence P. Myers and Frank W. Burcham, Jr. Jun. 1984 12 p refs Presented at the 20th AIAA/ASME/SAE Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984

(NASA-TM-85902; H-1247; NAS 1.15:85902) Avail: NTIS HC A02/MF A01 CSCL 21E

A flight evaluation of the F100 Engine Model Derivative (EMD) is conducted. The F100 EMD is an advanced version of the F100 engine that powers the F15 and F16 airplanes. The F100 EMD features a bigger fan, higher temperature turbine, a Digital Electronic Engine Control system (DEEC), and a newly designed 16 segment afterburner, all of which results in a 15 to 20 percent increase in sea level thrust. The flight evaluations consist of investigation of performance (thrust, fuel flow, and airflow) and operability (transient response and airstart) in the F-15 airplane. The performance of the F100 EMD is excellent. Aircraft acceleration time to Mach 2.0 is reduced by 23 percent with two F100 EMD engines. Several anomalies are discovered in the operability evaluations. A software change to the DEEC improved the throttle, and subsequent Cooper Harper ratings of 3 to 4 are obtained. In the extreme upper left hand corner of the flight enveloped, compressor stalls occurr when the throttle is retarded to idle power. These stalls are not predicted by altitude facility tests or stability for the compressor. M.A.C.

N84-24589*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE OF A HIGH-WORK LOW ASPECT RATION TURBINE TESTED WITH A REALISTIC INLET RADIAL TEMPERATURE PROFILE

Roy G. Stabe, Warren J. Whitney, and Thomas P. Moffitt 1984 24 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984

(NASA-TM-83655; E-2098; NAS 1.15:83655; AIAA-84-1161) Avail: NTIS HC A02/MF A01 CSCL 21E

Experimental results are presented for a 0.767 scale model of the first stage of a two-stage turbine designed for a high by-pass ratio engine. The turbine was tested with both uniform inlet conditions and with an inlet radial temperature profile simulating engine conditions. The inlet temperature profile was essentially mixed-out in the rotor. There was also substantial underturning of the exit flow at the mean diameter. Both of these effects were attributed to strong secondary flows in the rotor blading. There were no significant differences in the stage performance with either inlet condition when differences in tip clearance were considered. Performance was very close to design intent in both cases. Author

N84-24590# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abt. Verdichter.

INVESTIGATION OF THE BEHAVIOR OF AXIAL COMPRESSOR STAGES WITH STEADY STATE INLET DISTORTIONS Ph.D. Thesis - Technische Hochschule, Aachen

Manfred Lecht 1983 208 p refs In GERMAN; ENGLISH summary

(DFVLR-FB-83-39) Avail: NTIS HC A10/MF A01; DFVLR, Cologne DM 65

The influence of nonuniform inlet flow on the performance of a subsonic and a transonic axial compressor stage are investigated. Both compressor stages are exposed to screen-induced circumferential total pressure distortions, and moreover, the transonic stage is exposed to an inlet swirl distortion delivered by a special inlet guide vane. The influence of these types of distortion on the performance map as well as on the distribution of the main flow quantities within the stage is shown. An analysis of the measurements is directed to the unsteady rotor behavior in correspondence with a single airfoil subjected to instationary flow conditions. The phenomena of hysteresis as well as an unsteady overshoot of loading over the steady state limits are demonstrated. Based hereon and by means of an unsteady transfer behavior, a model of two compressors working in parallel is extended to give a better estimation of the surge line. Author

N84-24591# Annawerk Keramische Betriebe G.m.b.H., Roedental (West Germany). Geschaeftsbereich Ceranox.
DEVELOPMENT OF SILICON NITRIDE GAS TURBINE COMPONENTS, PHASE 2 Final Report, Jun. 1980
Ernst Gugel, Heinz Kessel, Gerhard Leimer, Hans Lindner, Antonio Novotny, Isfried Petzenhauser, and Dietmar Steinmann Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 103 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-322; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 21,50

The project, which was performed by Annawerk GmbH, aimed at the development of reaction-bonded silicon nitride (RBSN) and hotpressed silicon nitride (HPSN) and at the new development of pressureless-sintered silicon nitride (SSN) with regard to materials technology and testing. The main tasks were materials development, component fabrication, and testing, and test-methods. In the held on RBSN powder technology, pre-sintering and mechanical properties could be improved. The effects of additives, e.g. Fe, and temperature-dependent deterioration of strength in the first phase of the project were clarified in theory and practive. In the case of HPSN with MgO and Y2O3 as additives, further improvements were made in mechanical strength at room and high temperature and in oxidation resistance. Complicated prototype components were fabricated and tested. Fine-grain post-treatment promised to be very successful. Further improvements of testing procedures included non-destructive testing of components by ultrasonics, resonance-frequency measurements and statistical methods of fracture mechanics for life predictions. With regard to SSN a remarkable state of the art concerning materials developments could be reached, which was applied also in components.
Author

N84-24592# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
BEHAVIOR OF CASCADED AIRFOILS UNDER CONDITIONS OF HIGH MEAN LOADING AND FLOW UNSTEADINESS Final Technical Report, 1 Jun. 1982 - 31 May 1983
F. Sisto and R. B. Cole 15 Dec. 1983 48 p
(Contract N00014-82-K-0369)
(AD-A139799; ME-RT-83007) Avail: NTIS HC A03/MF A01 CSCL 21/5

The objectives of this research program were to measure the unsteady flow field in the rotor passage of an axial compressor and map this velocity field when operating near rotor blade stall. A laser Doppler velocimeter system was developed for this purpose and used in conjunction with a single stage compressor designed expressly to facilitate these measurements. An extensive data acquisition system utilizing microcomputer components was designed and partially assembled and data processing algorithms were developed to yield the velocity mapping from the data. Various program sub-elements were completed, but a successful on-rotor velocity realization was not achieved at contract termination. Propagating stall was observed on the compressor and modelling studies using simulated inputs to the data processing system indicated a potential for successful unsteady velocity field mapping.
Author (GRA)

N84-24738# Pratt and Whitney Aircraft of Canada Ltd., Mississauga (Ontario). Combustion Aerodynamics Dept.
FUEL CHARACTER EFFECTS ON PERFORMANCE OF SMALL GAS TURBINE COMBUSTION SYSTEMS
P. Sampath and M. Gratton *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24740# Laval Univ. (Quebec). Dept. de Genie Mecanique.
THE EFFECTS OF FUEL COMPOSITION UPON HEAT TRANSFER IN GAS TURBINE COMBUSTORS
J. Odgers and D. Kretschmer *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs Sponsored in part by National Sciences and Engineering Research Council of Canada (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24742# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DESIGN OF A COMBUSTION CHAMBERS WITH REVERSE FLOW FOR SMALL GAS TURBINES
Andre Mestre and Guy Lagain (TURBOMECA) *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p ref (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24743# Rolls-Royce Ltd., Bristol (England).
RECENT RESEARCH ON THE EFFLUX OF THE ROLLS-ROYCE VAPORISER FUEL INJECTOR
H. C. Low *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24749# Royal Aircraft Establishment, Farnborough (England).
THE DESIGN AND PERFORMANCE OF A COMBUSTOR WITH A MULTIPLE JET PRIMARY ZONE
J. R. Tilston and J. P. D. Hakluytt *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 9p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24755# Rolls-Royce Ltd., Derby (England). Combustion Technology Dept.
THE DESIGN AND DEVELOPMENT OF A LOW EMISSIONS TRANSPLY COMBUSTOR FOR THE CIVIL SPEY ENGINE
J. K. Bhangu, D. M. Snape, and B. R. Eardley *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 18p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24756# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
ADVANCED COMBUSTOR LINER COOLING CONCEPTS
B. Simon, D. Schuber, and U. Basler *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs Sponsored in part by German Ministry of Defence (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24757# Karlsruhe Univ. (West Germany). Lehrstuhl und Inst. fuer Thermische Stroemungsmaschinen.
DEVELOPMENT OF TEMPERATURE-, VELOCITY- AND CONCENTRATION-PROFILES IN A CURVED COMBUSTOR
S. Wittig, R. Kutz, B. E. Noll, and K. H. Platzer *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 9p refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24764# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. de Mecanique et Energetique des Systemes.
AN AERODYNAMIC STUDY OF COMBUSTION IN THE COMBUSTION CHAMBERS OF TURBOMACHINES: EXPERIMENTAL AND THEORETICAL APPROACHES [ETUDE AERODYNAMIQUE DE LA COMBUSTION DANS LES FOYERS DE TURBOMACHINES: APPROCHES EXPERIMENTALES ET THEORIQUES]
Guy Frager, Patrick Hebrard, Gerard Lavergne, and Ahmed Mir *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 16p refs In FRENCH (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24765# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).
PREDICTING COMBUSTOR EFFICIENCY AND STABILITY PERFORMANCES
Y. Chauveau, M. Desaulty, and G. Bayle-Laboure *In* AGARD

Combust. Probl. in Turbine Eng. Jan. 1984 7p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-24593*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
OPTIMAL COOPERATIVE CONTROL SYNTHESIS APPLIED TO A CONTROL-CONFIGURED AIRCRAFT
D. K. Schmidt and M. Innocenti Jan. 1984 33 p refs
(Grant NAG4-1)
(NASA-CR-170411; NAS 1.26:170411) Avail: NTIS HC A03/MF A01 CSCL 01C

A multivariable control augmentation synthesis method is presented that is intended to enable the designer to directly optimize pilot opinion rating of the augmented system. The approach involves the simultaneous solution for the augmentation and predicted pilot's compensation via optimal control techniques. The methodology is applied to the control law synthesis for a vehicle similar to the AFTI F16 control-configured aircraft. The resulting dynamics, expressed in terms of eigenstructure and time/frequency responses, are presented with analytical predictions of closed loop tracking performance, pilot compensation, and other predictors of pilot acceptance. M.A.C.

N84-24594# Bristol Univ. (England). Dept. of Aeronautical Engineering.
A DIGITAL FLIGHT CONTROL SYSTEM FOR AN UNSTABLE AIRCRAFT B.S. Thesis
J. Gunson and M. J. Hutchinson Jun. 1983 77 p refs
(BU-292) Avail: NTIS HC A05/MF A01

Digital simulation was used to compute responses of a typical fighter-type aircraft with a digital flight control system to control column and gust excitation. Handling qualities of the aircraft plus control system were evaluated by assessing response to step control column demands against the C* handling qualities criteria. Stable and unstable aircraft configurations were studied. By calculating system closed loop eigenvalues an analysis of the effect on stability of changes in various system gains, sampling rate and aircraft CG position was made. From these results the digital flight control system gains were modified to stabilize an aircraft with a more rearward CG position, while maintaining satisfactory handling qualities. Author

N84-24595# Glasgow Univ. (Scotland). Dept. of Aeronautics and Fluid Mechanics.
A SIMPLIFIED METHOD OF EVALUATING AIRCRAFT HANDLING QUALITIES USING A PILOT TRANSFER FUNCTION MODEL
P. N. Huang 4 Jan. 1984 16 p refs
(GU-AERO-8302) Avail: NTIS HC A02/MF A01

Calculations of the performance of a pilot and aircraft closed loop system were made using a simple pilot mathematical model obtained from simulator testing. Results show that correlation exists between the pilot handling rating and the mean square error signal in the pilot-aircraft circuit in response to a selected disturbance input. This approach could provide the basis for the approximate evaluation of aircraft handling qualities. Author

N84-24596# Glasgow Univ. (Scotland). Dept. of Aeronautics and Fluid Mechanics.
FAST ESTIMATION OF STATE FEEDBACK GAIN FOR THE DESIGN OF AIRCRAFT AUTOPILOTS
S. Y. Guan 4 Jan. 1984 24 p refs
(GU-AERO-8305) Avail: NTIS HC A02/MF A01

A fast estimation method to design autopilots for aircraft is presented. A two state feedback gains is determined simultaneously during the preliminary design stage according to some specified requirements. It is shown that the method is simple and straightforward and can be of practical use in the design of some widely used autopilots. E.A.K.

N84-24597# Neilsen Engineering and Research, Inc., Mountain View, Calif.
PRELIMINARY METHOD FOR ESTIMATING HINGE MOMENTS OF ALL-MOVABLE CONTROLS Final Report, 1 Mar. - 30 Nov. 1981
J. N. Nielsen and F. K. Goodwin Mar. 1982 344 p
(Contract N00014-81-C-0267)
(AD-A139726; AD-E401117; NEAR-TR-268) Avail: NTIS HC A15/MF A01 CSCL 20/4

The objective of the first phase of this 2-phase study is to develop a hinge-moment prediction method for all-movable controls for angles of attack up to 20 deg, control deflections to 15 deg, the complete range of roll angles, and Mach numbers from subsonic to hypersonic if possible. Based on a review of the literature, it was decided to modify on existing computer program, MISSILE 2, to improve its accuracy of hinge-moment prediction. A method based on strip theory and shock-expansion theory is used to improve the prediction of fin axial center-of-pressure position. A special method is included to account for canard and body vortices on fin axial center-of-pressure location. Special extrapolation procedures for the underlying data base were added. Comparison between hinge-moment data and prediction show good agreement at zero roll between Mach numbers of 1.3 and 3.7, but not at transonic speeds. When body or canard vortices are close to tail fins on the leeward side of the body, the predictions were usually not good. Canard fin hinge moments were generally well predicted. GRA

N84-24598# Army Research and Technology Labs., Moffett Field, Calif. Aeromechanics Lab.
A PILOTED SIMULATOR INVESTIGATION OF DECOUPLING HELICOPTERS BY USING A MODEL FOLLOWING CONTROL SYSTEM
G. Bouwer and K. B. Hilbert May 1984 17 p Presented at the 40th Ann. Forum of the American Helicopter Society, Arlington, Va., 16-18 May 1984
(AD-A139976) Avail: NTIS HC A02/MF A01 CSCL 01/3

A U.S. and German piloted simulation experiment conducted to evaluate the performance of a model following control system by applying it to hingeless rotor and teetering rotor helicopters is reported. The explicit model was a linear, decoupled model such that the pilot commanded pitch attitude with the longitudinal cyclic, roll attitude with the lateral cyclic, yaw rate with the pedals, and Earth fixed downward velocity with the collective. The results of the simulation indicate that the performance of the model following control system is primarily dependent on the limitations of the actuating system. Satisfactory handling qualities were achieved for both augmented helicopters flying two specified evaluation tasks: dolphin and slalom maneuvers. The significant improvements in task performance and handling qualities achieved for these two radically different helicopters, augmented with the designed model following control system, indicates the flexibility and versatility of this control technique. Author (GRA)

N84-24530# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
MULTIVARIABLE CONTROL LAW THEORY
In its Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 8-37 refs (For primary document see N84-24529 15-01)
Avail: NTIS HC A99/MF A01 CSCL 01/3

N84-24531# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
MULTIVARIABLE CONTROL LAWS FOR THE AFTI/F-16 M.S. Thesis
A. Finley Barfield *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 41-256 ref Previously announced

as N84-18210 (For primary document see N84-24529 15-01)
(AFIT/GE/EE/83S-4) Avail: NTIS HC A99/MF A01 CSCL 01/3

N84-24532# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
DESIGN OF A COMPLETE MULTIVARIABLE DIGITAL FLIGHT CONTROL SYSTEM M.S. Thesis
Jon M. Bauschlicher *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 259-416 refs (For primary document see N84-24529 15-01)
(AFIT/GE/EE/82D-18) Avail: NTIS HC A99/MF A01 CSCL 01/3

N84-24533# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
DIGITAL MULTIVARIABLE TRACKER CONTROL LAWS FOR THE C-141-A STARLIFTER AIRCRAFT M.S. Thesis
Michael A. Masi *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 419-515 refs (For primary document see N84-24529 15-01)
(AFIT/GE/EE/82D-47) Avail: NTIS HC A99/MF A01 CSCL 01/3

N84-24534# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
HIGH-GAIN ERROR ACTUATED FLIGHT CONTROL SYSTEMS FOR CONTINUOUS LINEAR MULTIVARIABLE PLANTS M.S. Thesis
Thomas Lewis *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 517-573 refs (For primary document see N84-24529 15-01)
(AFIT/GAE/EE/82D-1) Avail: NTIS HC A99/MF A01 CSCL 01/3

N84-24535# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
RECONFIGURABLE DIGITAL CONTROL LAWS FOR THE A-7D DIGITAC 2 AIRCRAFT WITH FAILED PRIMARY CONTROL SURFACES M.S. Thesis
Daniel E. Russ *In its* Proc. of the Workshop on Multivariate Control Systems Sep. 1983 p 575-671 refs (For primary document see N84-24529 15-01)
(AFIT/GE/EE/82D-59) Avail: NTIS HC A99/MF A01 CSCL 01/3

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-24599# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Structures Lab.
CONDITION EVALUATION OF SUPERSONIC NAVAL ORDNANCE RESEARCH TRACK (SNORT) Final Report
B. R. Sullivan, C. E. Pace, and R. L. Campbell Feb. 1984 278 p
(AD-A140036; WES/MP/SL-84-1) Avail: NTIS HC A13/MF A01 CSCL 13/13

The evaluation included both theoretical analysis and field tests. The concrete, soil, and water were sampled and tested in the laboratory. Nondestructive tests were used to determine locations for coring concrete and to develop a condition profile for the structure. Load tests were conducted on the structure to determine deflections for comparison with analytical calculations. These comparisons show that deterioration has not reduced the structural capacity seriously at this time. Laboratory tests show the concrete to be severely deteriorated at some locations and sound at other locations only inches away. The concrete is severely cracked, corrosion of the reinforcement is occurring, and alkali-silica reaction is evident throughout the structure. The deterioration is expected to progress and accelerate as moisture migration to the interior of the concrete increases due to crack growth and further deterioration. The deteriorated condition of the existing track dictated a recommendation for replacement; therefore, a preliminary design for a new track was accomplished. The existing track should remain usable at current loading during construction of a new track. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-24600*# National Academy of Sciences - National Research Council, Washington, D. C.
ACTIVITIES OF THE AERONAUTICS AND SPACE ENGINEERING BOARD COMMISSION ON ENGINEERING AND TECHNICAL SYSTEMS Summary Report, 1 Jan. - 31 Mar. 1984
Apr. 1984 7 p
(Contract NASw-3455)
(NASA-CR-173529; NAS 1.26:173529; SR-14) Avail: NTIS HC A02/MF A01 CSCL 13B

The agenda of the Aeronautics and Space Engineering Board meeting is reviewed. Items discussed included; engineering and technical requirements of the space station, NASA's altitude wind tunnel, rocket engine casings, advanced flight vehicle technology, the space shuttle, and on-orbit space maintenance. Board members along with their institutional affiliation are listed. R.S.F.

N84-24601*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
SPACE STATION NEEDS ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY COSTING WORKING GROUP BRIEFING Final Report
7 Apr. 1983 21 p Presented at the Mater. Processing in Space Workshop, Redondo Beach, Calif., 27-28 Oct. 1982
(Contract NASw-3681)
(NASA-CR-173517; NAS 1.26:173517) Avail: NTIS HC A02/MF A01 CSCL 22A

Individuals in the United States who understand the promise of materials processing in space and who also are senior technical personnel associated with commercial firms that process materials: (1) endorsed the concept of a space station as a desirable national asset; (2) stated that a commercial MPS research program is mandatory to extend commericalization of space for materials processing; and (3) described in general terms a national research laboratory and free flying facilities that are needed. Participants agreed that industry R&D is motivated largely by market pull rather than by technology push, that initial interest is low-g materials research; and that to farther, commercial market assurance (a salable product) is a must. A.R.H.

N84-24602# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3
THE RESEARCH OF NATIONAL DEFENCE'S (FOA) FUTURE POLICY DOCUMENT ON SPACE TECHNOLOGY
S. Arnzen, P.-O. Bergman, V. Bogren, A. Scarsson, S. Wahlborn, and T. Rhaug Jan. 1984 38 p In SWEDISH; ENGLISH summary
(FOA-A-30034-E1; ISSN-0281-0212) Avail: NTIS HC A03/MF A01

Space technology and its military applications is reviewed. Relevant issues with regard to security policy and the various threat aspects are discussed. The fundamental knowledge needed for a relevant evaluation of military space technology is discussed and the role of FOA in studying these aspects is outlined. E.A.K.

N84-24603# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
GUIDANCE AND CONTROL TECHNIQUES FOR ADVANCED SPACE VEHICLES

Loughton, England Jan. 1984 348 p refs In ENGLISH and FRENCH Symp. held in Florence, 27-30 Sep. 1983
(AGARD-CP-350; ISBN-92-835-0349-X) Avail: NTIS HC A15/MF A01

This symposium dealt with spacecraft problems, the topic being guidance and control techniques for advanced space vehicles. Military applications of space for navigation, communication and intelligence impose increasing requirements on spacecraft capacity, orbit control and pointing accuracy. To meet the requirements for future spacecraft the performance of existing components, such as actuators and sensors, is improved or new concepts are developed. In particular the use of microprocessors and other data distribution systems permits multifunctional use of various sensors or information sources to produce effective, survivable systems at low cost. Increasing on-board computing capacity enables the use of sophisticated software for effective complex spacecraft control. A unique aspect of large spacecraft is the control of the structural configuration in order to achieve a specific pointing accuracy. Large structures, with their mechanical flexibility, present particular problems to the control engineer and control/structure interaction (CSI) is a driving force in many current programs and figured largely in the papers presented. For individual titles, see N84-24604 through N84-24626.

N84-24604*# National Aeronautics and Space Administration, Washington, D. C.
SPACECRAFT CONTROL RESEARCH AT NASA c18
John B. Dahlgren and Lawrence W. Taylor, Jr. (NASA. Langley Research Center) *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 14 p refs (For primary document see N84-24603 15-12)
Avail: NTIS HC A15/MF A01 CSCL 22B

Future missions is space will require controlling spacecraft which are both large and flexible. The limited inherent damping and the uncertain and changing dynamic characteristics of many of these vehicles, such as manned space stations and large antennas, will revolutionize spacecraft control requirements. In preparation for the time that such control systems are required, considerable research and technology development is necessary. A program is in place at NASA for the development of active control technology to support major initiatives for space station and advanced spacecraft. A number of key control technology program needs are cited in the paper as required for these and other future NASA missions together with an integrated controls/structures technology flight experiment to demonstrate and validate technology for large flexible structures. Author

N84-24605# Engins Matra, Toulouse (France).
THE ROLE OF ONBOARD INTELLIGENCE AND OF ORBITAL SERVICING IN THE INCREASE OF SATELLITE LIFETIME [ROLE DE LINTELLIGENCE DE BORD ET DE LENTRETIEN EN ORBITE DANS LACCROISSEMENT DE LA DUREE DE VIE DES SATELLITES] c15
Par C. Cougnet and J. P. Sotta *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 14 p In FRENCH (For primary document see N84-24603 15-12)
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The continued increase in satellite lifetime is now or is going to become critical with respect to the maintenance of system reliability and the risk of mission obsolescence. Resource to redundant equipment becomes more and more penalizing particularly because of the limited capacities of the launch methods. Futhermore, the classic satellite concept does not permit avoiding mission obsolescence or long duration life. To remedy these problems, two possible complementary methods are presented. One involves the use of satellite onboard intelligence to enable better management of its configuration and platform subsystems in order to assure a high level of availability to he satellite. The other solution is orbital servicing which permits periodic adjustment of reliability and platform autonomy as well as the eventual exchange of the payload. This solution calls for new techniques: rendezvous, assembling, and the space robot. Transl. by A.R.H.

N84-24606# Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Brevannes (France).
IMAGE DISSECTOR TUBE STAR TRACKERS PERFORMANCE: ADVANTAGES AND DRAWBACKS AS COMPARED TO THOSE OF CHARGE TRANSFER DEVICE STAR TRACKERS c74
H. Bourcier and M. Vite *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 18 p In FRENCH and ENGLISH (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

Performance characteristics which can be achieved with image dissector tube star trackers are given based on equipment manufactured for IPS/Spacelab and Exosat satellite. The advantages and disadvantages of such instruments are discussed with respect to equipment based on solid state devices of charge transfer type. The analysis of the performances is presented versus the intrinsic characteristics of the detectors and the technological constraints related to their use. A.R.H.

N84-24607# Raytheon Co., Sudbury, Mass. Equipment Div.
FAULT TOLERANT SPACEBORNE COMPUTER c60
Davis R. Bates, Jr., James E. Schell (Army Communications-Electronics Command, Fort Monmouth, N.J.), and G. Robert Couranz *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 14 p (For primary document see N84-24603 15-12)
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A method of utilizing present integrated circuit componentry with future technology insertion has been developed on the FTSC Program. The FTSC is designed to support a variety of spaceborne missions with a 95% probability of surviving, unattended and without degradation in performance, for five to seven years. Besides easing the ground station scheduling requirements, this capability increases the overall satellite survivability. The purpose of this paper is to present a concept of achieving the survivability by the utilization of various fault tolerant techniques. These concepts of fault tolerance, as well as technology insertion, are also being incorporated in the Military Computer Family Program currently under development. B.W.

N84-24608# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany). Engineering Dept. for Gyroscopic and Space Products.
A DOUBLE GIMBALLED MOMENTUM WHEEL FOR PRECISION 3-AXIS ATTITUDE CONTROL c18
Werner Auer *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 8 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

For precision three-axis attitude control of space vehicles, a Double Gimballed Momentum Wheel (DGMW) as attitude actuator is a favorable approach. A high reliability DGMW of modular design with two momentum wheels and two direct drive ultra high resolution stepper motors plus pick-offs per gimbal axis (full redundancy; no caging during launch) was designed, built and qualification tested, together with an associated wheel and gimbal drive electronics. In addition, extensive system tests were performed on a three-axis air bearing table which proved the excellent control capabilities of this DGMW. Besides the measurement under stationary conditions with an accuracy of 18 sec of arc, also the transient behavior was studied. Due to the high torque capability (up to 0.2 Nm around the momentum wheel axis and up to 1 Nm around the gimbal axes) rapid and accurate pointing and repointing of spacecraft are possible. Therefore, the DGMW system can be designed into tracking loops to assure continuous pointing of spacecraft instruments with a rapid assignment capability. Author

N84-24609# Ferranti Ltd., Edinburgh (Scotland). Navigation Systems Dept.
CURRENT WORK ON HIGH-GRADE SPACE GYROS AT FERRANTI IN THE UK c35
John Welburn *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 4 p (For primary document see N84-24603 15-12)

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Certain satellite missions require gyroscopes of very high accuracy for attitude measurement. Formerly, floated rate integrating gyros have been widely used. More recently in the USA, 2-axis DTG's have been used, and agencies are now beginning to consider what type of instrument to use in the future. Features such as fluid dissociation, which are rumoured to occur in floated gyros over a long period of time, can be controlled and minimized by care in design, assembly techniques, and cleanliness. In any event, the phenomena caused by fluid effects generally only affect g-sensitive performance aspects, which are of no relevance in orbital applications. The feasibility of using ball-bearing gyros for long-life satellite applications is discussed. B.W.

N84-24610# Societe Nationale Industrielle Aerospatiale, Cannes (France).
OVERCOMING UNOBSERVABILITY IN 3-AXIS STABILIZATION OF SATELLITES c15
Lionel Passeron and Claude Bozzo (Compagnie de Signaux et d'Entreprises Electriques, Paris) *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 21 p refs (For primary document see N84-24603 15-12)
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An optimal solution is provided to the problem of attitude estimation for a three-axis stabilized satellite devoid of yaw sensor and undergoing significant disturbing torques. Influence of such torques on expectable system performance is analysed via a geometric approach. Estimation of satellite attitude is demonstrated to be systematically impaired by an error resulting from the system's torque-induced unobservability. The said error is then explicitly assessed as a function of the disturbing torques. Furthermore, assuming a priori knowledge of the disturbing torque amplitudes, an optimal observability canonical form is derived. Optimal attitude estimation is finally provided, together with the expression of the relative, thus minimized, systematic error. Author

N84-24611# MATRA Espace, Paris-Velizy (France). Space Branch.
MULTIFUNCTION SPACECRAFT ATTITUDE ESTIMATION AND NAVIGATION SYSTEM c18
J. C. Amieux and B. Caludinon *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 17 p (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

The primary function of a spacecraft attitude control subsystem is the attitude determination and, more generally, the state estimation (attitude of the main body, appendages and flexible modes). The so-called optico-inertial concept is first described with application to a number of modern spacecraft; an example of implementation using space-qualified microprocessors is given in detail; the state estimation of a flexible spacecraft is then considered, a technique which can be readily implemented on existing hardware. The extension of this concept to autonomous orbit control of an orbiting spacecraft is then considered for future development. Author

N84-24612# British Aerospace Dynamics Group, Bristol (England). Space and Communications Div.
A FILTERED ATTITUDE DETERMINATION SYSTEM FOR SPACECRAFT MEASUREMENT AND CONTROL c18
Maxwell Noton *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 21 p refs Sponsored in part by RAE, Farnborough, Engl. (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

This paper refers to a collaborative project to develop an accurate attitude determination system based on the combined use of gyros and star-crossing detectors. The latter are attractive for Earth-pointing satellites but the intermittent nature of the data introduces complications, compared to star tracker systems. Background is given on the hardware, but the emphasis is on formulation of the estimating algorithm (suitable for limited wordlength microprocessors), characterization of gyro drift, and estimation of overall performance both for low-Earth and geostationary orbits. Author

N84-24613# National Aerospace Lab., Emmeloord (Netherlands).
INERTIAL-OPTICAL ATTITUDE DETERMINATION AND MODEL FOLLOWING CONTROL OF MANEUVERING SPACECRAFT c18
T. Zwartbol and A. P. Terpstra *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 16 p refs Sponsored in part by Netherlands Agency for Aerospace Programs NIVR (For primary document see N84-24603 15-12)
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The paper presents an approach to on-board commanding, estimation, and control of the attitude motion of maneuvering spacecraft, based on modern control principles. Firstly the control algorithms are discussed. The control law is based on explicit model following. It comprises single-axis models of the spacecraft motion, which generate a target trajectory and associated target control. The spacecraft tracks the target trajectory by means of the target control which is fed forward to the spacecraft, and by means of state feedback control. A spacecraft state estimator provides for the estimates of the spacecraft state (attitude, angular velocity), and provides for the estimate of the disturbance torque which is used for disturbance torque compensation. Secondly an algorithm for inertial-optical attitude determination and estimation of gyro parameters (drift rate bias and scale factor error) is presented. The algorithms were validated in software simulations of an attitude control system of the type as used in the Infra Red Astronomical Satellite (IRAS). The control law and state estimator were tested inflight, in an on-board experiment with the IRAS spacecraft. The considered control system comprises a strapdown rate-integrating gyro and a slit-type star sensor for optical-inertial attitude sensing, a reaction wheel actuator, and a 16-bit on-board computer. The estimation and control algorithms are described, design trade-offs are discussed, simulation results and in-flight results are presented. Author

N84-24614# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
DOCKING MECHANISM FOR IN-ORBIT ASSEMBLY AND SPACECRAFT SERVICING
Fritz Gampe *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 12 p (For primary document see N84-24603 15-12)
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Future in-orbit infrastructure requires the usage of a Docking Mechanism Subsystem (DMS) for in-orbit assembly and spacecraft servicing. As a first entry for European applications unmanned, autonomous docking missions are foreseen as well in low Earth orbit (processing platforms) as in geostationary orbit (communication satellite clustering). The Rendezvous and Docking (RVD) operation is a key technology to realize such type of mission. The DMS is imbedded in a system performing the 'last meters' problem, where specially the Attitude and Orbit Control Subsystem (AOCS) closely cooperates with the DMS. The DMS itself is composed of the Docking Mechanism itself and the Docking Mechanism Electronics. Dependent on the initial separation conditions two docking concepts are considered: the DMS- and the AOCS - controlled closure. A first docking demonstration is envisaged during the EURECA-2 mission in 1989/90. Author

N84-24615# Aeritalia S.p.A., Torino (Italy). Space Systems Div.
THE INFLUENCE OF SENSOR AND THRUSTER IMPERFECTIONS ON THE ATTITUDE AND POSITION OF A SPACECRAFT PERFORMING A RENDEZVOUS c18
R. Ancillotti and C. Cassi *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 13 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

The operational conditions of two spacecraft performing a rendezvous in geostationary orbit are given with the relative motion equation and the relevant control law. The concept of position, velocity and attitude measurement of the chaser vehicle with

respect to the target one is given in order to allow the evaluation of the measurement errors. Simulations show the effect of the errors sources on the flight path of the approaching vehicle and point out the necessity of a good matching between the sensor accuracy and the minimum impulse level of the actuation system. Author

N84-24616# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
CONTROL ASPECTS AS ELABORATED IN SPACE RENDEZVOUS SIMULATIONS
P. Natenbruk and D. Rangnitt *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 10 p (For primary document see N84-24603 15-12)
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The European Space Agency's system technology study effort related to in-orbit operations, covers rendezvous and docking between two spacecraft one of which is actively doing the rendezvous while the other passively waits. Unlike the US missions, RVD to be done without any man in space. The chaser does its operations to some extent automatically, having on board the degree of autonomy needed. Otherwise, it is steered from the ground by real-time or time tagged commands depending upon the contact opportunities. A program which simulates the homing phase and final approach control is described. A.R.H.

N84-24617# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
OPTIMIZING THE MANEUVERS OF AN OBSERVATION SATELLITE FOR RAPID OVERFLIGHT OF A PRECISE POINT ON EARTH [OPTIMISATION DES MANOEUVRES DUN SATELLITE DOBSERVATION EN VUE DUN SURVOL RAPIDE DUN POINT DU GLOBE] **c15**
A. M. Mainguy, C. Aumasson, and S. Laffy *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 1 p In FRENCH (For primary document see N84-24603 15-12)
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For the purpose of heightened surveillance, it may be necessary to modify the quasipolar circular orbit of an Earth observation satellite and place it in a geosynchronous circular orbit in order to observe repeatedly a precise point on Earth once a day over a given time period. This maneuver should be effected as rapidly as possible, in less than two days. Because the altitudes of the orbits are close, it is possible to get rid of the constraints of heliosynchronism and solve the problem by considering the two orbits to have the same inclination. The difficulty of the problem lies in the fact that the maneuver must be accomplished in a short time period, with limited reserve capacity, and with an engine with a low power level. The maneuver must proceed by stages. Three studies are described in an effort to solve the generalized problem. One uses simplified hypotheses on the physical constraints and mathematical equations. The second, with more realistic hypotheses, accounts for the low thrust level and establishes the propulsive arc. The third study addresses the problem without simplification. It is a functional optimization in which the controls to be determined are the power module and its orientation in the local orbital reference. Transl. by A.R.H.

N84-24618# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
AN APPROACH TO ATTITUDE CONTROL MANEUVERS WHICH HELPS MAINTAIN ORBIT INCLINATION **c15**
W. Michael Bowles and Mark R. Altobelli *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 8 p (For primary document see N84-24603 15-12)
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An algorithm for attitude control is presented that derives a benefit for orbit inclination. This algorithm is useful for a spinning satellite using an offset axial thruster to perform attitude maneuvers. Depending on the circumstances of the mission, significant fuel savings may be derived by the use of this algorithm. Author

N84-24619# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
CHARACTERIZATION OF UNCERTAINTY FOR LARGE SPACE STRUCTURE CONTROL PROBLEMS **c18**
John C. Doyle and Joseph E. Wall *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 19 p refs Sponsored in part by Honeywell Internal Research and Development Funding (For primary document see N84-24603 15-12)
(Contract F49620-82-C-0090)
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A new formulation of the feedback control problem that captures both its performance and robustness aspects is reviewed. The basic analysis tool in this formulation is the structured singular value. The methods are potentially applicable to Large Space Structure Control Problems since they allow for uncertainty in a very natural way. Author

N84-24620# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ATTITUDE CONTROL ON LARGE FLEXIBLE SPACECRAFT **c18**
Goetz Thieme *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 15 p refs Sponsored in part by ESA (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

Some results found during the investigation of control problems of large flexible spacecraft are presented. A triple plate configuration of such a spacecraft is defined and studied. The model is defined by modal data derived from finite element modelling. The order reduction methods applied are briefly described and results of order reduction are presented. An attitude control concept with low and high authority control was used to design an attitude controller for the reduced model. The stability and response of the original system together with the reduced controller is analyzed. Author

N84-24621# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
LOW AUTHORITY CONTROL OF FLEXIBLE SPACECRAFT VIA NUMERICAL OPTIMIZATION **c18**
Gerd Schulz *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 16 p refs (For primary document see N84-24603 15-12)
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For the design of low authority controllers for attitude control of flexible spacecraft a new method based on numerical optimization is presented. Thereby a dominant criterion to be optimized is determined, and the design requirements are formulated as constraints. Two different criteria are investigated: first a dissipation energy criterion is maximized and second a control energy criterion is minimized. The method is applied for attitude controller design of two models, the 'Draper Model No. 1 and the Purdue Model'. The first represents a flexible tetrahedral truss structure while the latter can be considered as model of a solar power satellite. Damping requirements for these models are formulated as design objectives and the controllers are determined using the proposed method. The achieved results show that due to the now existing efficient optimization software, controller design via numerical optimization is a useful and flexible tool for system design. This flexibility arises from the fact that arbitrary design criteria can be implemented. Author

N84-24622# Rome Univ. (Italy). Dept. of Aerospace.
A DECENTRALIZED ACTIVE CONTROL SYSTEM FOR A LARGE FLEXIBLE STRUCTURE IN SPACE **c18**
Achille Danesi *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 15 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

A new strategy in controlling the modal shapes of large structure in space is presented. An active low authority modal control system, consisting of a discrete number of servo system

units (M.C.U.) distributed along flexible masts supporting RF radiators, is provided to measure and control the local structural deformations in order to obtain a modal shapes resulting in acceptable pointing error for the RF radiators. Each servo unit is conceived as a model following control system implementing a strategy based on fast fourier transformation (F.F.T.) pairs computations. The control efforts applied by the M.C.U.s to the mast control points are made proportional to the spectral error function generated by a real time F.F.T. dedicated microprocessor as the difference between the measured and desidered modal spectra relative to the antenna angular deflections in respect to a fixed set point. The decentralized control system organized by a central controller residing in the master M.C.U., will force the antenna to match the model dynamical behavior which is expected to improve the antenna pointing accuracy within the large space structure design requirements. Author

N84-24623# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
DESIGN AND ROBUSTNESS ANALYSIS OF REDUCED ORDER CONTROLLERS FOR LARGE FLEXIBLE SPACE VEHICLES **c18**
Siva S. Banda, D. Brett Ridgely, Hsi-Han Yeh, and Douglas V. Palmer *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 25 p refs (For primary document see N84-24603 15-12)
Avail: NTIS HC A15/MF A01

In the control design of a large flexible space vehicle, a finite element model is truncated and the control system is designed on the basis of the reduced order model. The step-by-step application of frequency-shaped Linear - Quadratic - Gaussian methodology is discussed, as well as payoffs and costs of this method. The procedure for choosing and forming both state and control frequency - weightings is shown. Treating the unmodelled dynamics of the structure as a source of plant uncertainty, stability robustness evaluation is discussed. Practical usefulness of the singular-valued closed-loop performance analysis and its possible improvement are also discussed. Author

N84-24624# Singer Co., Wayne, N. J.
THE DESIGN, SIMULATION AND DEVELOPMENTAL TESTING OF THE SPACE SHUTTLE DATA BUS SYSTEM **c16**
Albert J. Shapiro *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 22 p refs (For primary document see N84-24603 15-12)
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A suggested sequence to be followed in the design, development analysis and simulation of a digital data bus system is discussed. Also discussed are the computer modeling/simulations performed and the hardware verification test results obtained on elements of the Space Shuttle Orbiter data bus. A number of specific modules developed for the Space Shuttle are described as well as MIL-STD-1553 Remote Terminal Bus Controllers (RT/BC) in operational use by the U.S.A.F. R.J.F.

N84-24625# Dassault (E. M.) Co., St. Cloud (France).
CERTIFYING ONBOARD SOFTWARE: A TOTAL PROGRESSIVE APPROACH [LA CERTIFICATION DES LOGICIELS EMBARQUES: UNE APPROCHE GLOBALE ET PROGRESSIVE] **c18**
G. Bracon *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 10 p refs In FRENCH (For primary document see N84-24603 15-12)
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The complexity and growing criticality of functions assured by software in systems vital for safety engender a difficult problem in computer program certification. Until the present, the method and tools (particularly tests) used at ESD in a project such as the Mirage 2000, permitted the attainment of a high level of quality in software products. However, the continued growth of the volume of programs and the ever more vital functions they exercise, requires effort in the quality assurance domain. Techniques actually used for verification and validation are described. Current studies and developments are examined including a system for helping define software needs; a system for helping in dynamic tests of real time programs; the definition of measurements of quality which can be selected by application to a structured development; and the formalized products which are issued from them.
Transl. by A.R.H.

N84-24626# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
VERIFICATION AND VALIDATION TECHNIQUES APPLIED TO THE RECONFIGURABLE BLOCK 5D SATELLITE SOFTWARE **c61**
William C. Diniak *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 12 p refs (For primary document see N84-24603 15-12)
(Contracts F04701-74-C-0020; F04701-78-C-0018)
Avail: NTIS HC A15/MF A01

The U.S. Air Force Defense Meteorological Satellite Program (DMSP) Block 5D satellite uses two general purpose digital flight computers for control of the satellite and launch vehicle. During the life of six satellites, various reconfigurations of the flight software were accomplished to achieve improvements or to compensate for problems. An independent verification and validation (IV&V) process was conducted on that flight software prior to launch and prior to uplink of major software changes. To accomplish this, a closed-loop digital simulation of the mission to exercise the actual flight software in a realistic environment was developed and used. This experience, focusing on how both the simulation and the IV&V process evolved as a consequence of the flight history is described. R.J.F.

N84-24633*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTRODUCTION TO LONG-DURATION EXPOSURE FACILITY
William H. Kinard *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 1-5 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 22A

N84-24690*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE ENVIRONMENT EFFECTS (M0006)
Joseph A. Angelo, Jr., Richard G. Madonna, Lynn P. Altadonna (Perkin-Elmer), Michael D. DAgostino, Joseph Y. Chang, Robert R. Alfano, and Van L. Caplan *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 185-187 Prepared in cooperation with Air Force Technical Applications Center, Patrick AFB, Fla. and City College, New York (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 22A

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N84-24627 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
UTILIZATION OF SATELLITE OBSERVATIONS TO DETERMINE THE MEAN ORBITAL ELEMENTS Thesis - Bonn Univ. [AUSWERTUNG VON SATELLITENBEOBACHTUNGEN ZUR BESTIMMUNG VON MITTLEREN BAHNELEMENTEN]
H. G. Peters Dec. 1983 73 p refs In GERMAN; ENGLISH summary
(Contract BMVg-FOA-T/RF31/81005/82302)
(Lfd-219; Rept-12-83) Copyright. Avail: Issuing Activity

A special case of the boundary-value problem of perturbed Kepler motion is considered; namely, satellite motion in the aspherical gravitational field of the Earth. For this, an analytical solution in the form of mean orbital elements is known. An overview of existing methods for solving this boundary-value problem is given. A method for determining the mean orbital elements is presented and their convergence is investigated. Results from test

calculations are given, using two types of observed values - combined range and angle measurements and pure direction measurements. Author

N84-24628# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SEMI-ANALYTICAL PROCEDURE FOR THE PROPAGATION OF ARTIFICIAL SATELLITE ORBITS BASED ON PARAMETER ESTIMATION [PROCEDIMENTO SEMI-ANALITICO BASEADO EM ESTIMACAO DE PARAMETROS PARA PROPAGACAO DE ORBITAS DE SATELITAS ARTIFICIAIS]
Atair Rios Neto and Wilson Custodio Canesin daSilva May 1983 12 p refs In PORTUGUESE; ENGLISH summary
(INPE-2757-PRE/333) Avail: NTIS HC A02/MF A01

A procedure to propagate the orbit of terrestrial artificial satellites through parameterized mathematical expressions is presented. Simulated data of observations are used during one period, and with the help of Estimation Theory of Parameters and particularly the Kalman filter technique, the parameters of the equations are estimated. Obtained the time variation equations of the element of the orbit, this can be propagated with considerable saving of computation efforts. Author

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-24629# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
US ARMY TEST AND EVALUATION COMMAND TEST OPERATIONS PROCEDURE. DETERMINATION OF RANGE DANGER AREAS Interim Report
21 Apr. 1983 20 p
(AD-A139813; TOP-3-2-607) Avail: NTIS HC A02/MF A01 CSCL 14/2

This TOP provides guidance for acquiring the data required by US Army Training and Doctrine Command (TRADOC) to establish danger areas for training, target practice, and combat, when using conventional weapons and ammunition, small rockets, guided missiles, and training rounds for nuclear and chemical ammunition. Rockets and missiles are excluded from this TOP as is ammunition with live nuclear or chemical warheads. This TOP does not apply to range danger areas for DARCOM's proving grounds where different range safety procedures apply. GRA

N84-24630# California Inst. of Tech., Pasadena. Dept. of Computer Science.
SUBMICRON SYSTEMS ARCHITECTURE Semiannual Technical Report, 16 Apr. - 15 Oct. 1983
C. L. Seitz Nov. 1983 45 p
(Contract N00014-79-C-0597; ARPA Order 3771)
(AD-A139819; Rept-5103-TR-83) Avail: NTIS HC A03/MF A01 CSCL 14/2

This document reports the research activities and results for the period 16 April 1983 to 15 October 1983 under the Defense Advanced Research Project Agency Submicron Systems Architecture Project. The central theme of this research is the architecture and design of VLSI systems appropriate to a microcircuit technology scaled to submicron feature sizes, and includes related efforts in concurrent computation and VLSI design. GRA

N84-24631# Range Commanders Council, White Sands Missile Range, N. Mex. Range Safety Group.
RANGE SAFETY TRANSPONDER CATALOG
Mar. 1984 144 p
(AD-A140095; RSG-308-84) Avail: NTIS HC A07/MF A01 CSCL 17/9

This catalog provides reference information on radar tracking transponders used to support range safety functions at various U.S. missile ranges and test facilities. Inclusion of hardware in this catalog does not constitute approval or endorsement for use at any government installation. Use of a specific transponder at a missile range or test facility must be approved by the Commander of that installation. The information contained in this publication is taken from manufacturer-supplied specifications. It is provided as reference material only and is not intended as an endorsement of any model. In addition, all references to C-band frequencies are understood to be 5.4 to 5.9 GHz. Author (GRA)

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-24632*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONG DURATION EXPOSURE FACILITY (LDEF). MISSION 1 EXPERIMENTS
Lenwood G. Clark, ed., William H. Kinard, ed., David L. Carter, Jr., ed., and James L. Jones, Jr., ed. Washington Feb. 1984 196 p
(NASA-SP-473; L-15230; NAS 1.21:473) Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 22A

Spaceborne experiments using the space shuttle payload known as the Long Duration Exposure Facility are described. Experiments in the fields of materials, coatings, thermal systems, power and propulsion, electronic, and optics are discussed. For individual titles, see N84-24633 through N84-24690.

N84-24633*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTRODUCTION TO LONG-DURATION EXPOSURE FACILITY **c12**
William H. Kinard *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 1-5 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 22A

A description of the structure and uses of the Long Duration Exposure Facility (LDEF) is given. The LDEF was designed to provide a large number of economical opportunities for science and technology experiments that require modest electrical power and data processing while in space and which benefit from postflight laboratory investigations with the retrieved experiment hardware. Like the Shuttle, the LDEF is reusable, and repeat missions are planned, each with a new complement of experiments. The LDEF is essentially a free-flying cylindrical structure. The experiments on LDEF are totally self-contained in trays mounted on the exterior of the structure. LDEF can accommodate 86 experiment trays, 72 around the circumference and 14 on the two ends. The LDEF is delivered to Earth orbit by the Shuttle. In orbit, the Shuttle remote manipulator system removes the LDEF from the Shuttle payload bay and places it in a gravity-gradient-stabilized attitude. After an extended period in orbit, which is set by experiment requirements, the LDEF is retrieved on a subsequent Shuttle flight. R.J.F.

N84-24634*# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
GROWTH OF CRYSTALS FROM SOLUTIONS IN LOW GRAVITY (A0139A) **c76**
M. David Lind and Kjeld F. Nielsen (Technical Univ. of Denmark) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 8-10 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20B

The objective of the low gravity crystal growth experiments is to develop a novel solute diffusion method for growing single crystals. The experiments will utilize specially designed reactors with three or more compartments separated by valves to keep the reactant solutions and solvent separated until the apparatus reaches low gravity. There will be a mechanism for opening the valves automatically to initiate the diffusion and growth processes. The reactant reservoirs will be large enough to take advantage of the time provided by the Long Duration Exposure Facility (LDEF) flight. An array of several reactors will be mounted in a 12-in.-deep end center tray located on the Earth-facing end of the LDEF. Several reactors operating simultaneously will allow experimentation with more than one crystal growth system and/or variations of conditions for each. The reactors will be enclosed in a vacuum tight container and will be surrounded by thermal insulation. The temperature (approximately 35 deg C) will be regulated and any departures from the desired temperature will be recorded. Power requirements will be provided by LiSO2 batteries. R.J.F.

N84-24635*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATOMIC-OXYGEN STIMULATED OUTGASSING (A0034) c27
Robert L. Scott, Jr. (Southern Univ.) and Roger C. Linton *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 11-13 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

The objective of this experiment is to determine if the impingement of atomic oxygen in near-Earth orbit is a major factor in producing optically damaging outgassed products. The expected results will be to obtain samples which have been exposed to atomic oxygen for long durations. Analysis of these samples will determine if the impingement of atomic oxygen on the thermal control surfaces stimulates a significant amount of outgassed products. This experiment will give a clearer picture of the contamination problem and will assist in assuring that future Shuttle payloads, such as the Space Telescope and High-Energy Astronomy Observatory, will not experience Skylab contamination levels. Selected thermal control surfaces will be exposed to the atomic oxygen in near-Earth orbit. Passive collecting samples will collect any induced outgassing resulting from oxygen impingement. The optical condition of the passive samples will be measured using a ground-based integrating sphere reflectometer and a directional reflectometer. R.J.F.

N84-24636*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTERACTION OF ATOMIC OXYGEN WITH SOLID SURFACES AT ORBITAL ALTITUDES (A0114) c25
John C. Gregory (Alabama Univ.) and Palmer N. Peters *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 14-18 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 07D

The basic approach to this experiment is to expose a wide variety of material surfaces to the atomic flux in orbit. The experiment is passive and depends on preflight and postflight measurements of the test surfaces in the laboratory. The experiment will also include a reflectometer device to measure atomic beam reflection angles and thus momentum accommodations, and a unique passive spacecraft attitude sensor. Samples consisting of solid disks or thin film coatings on substrate disks will be mounted in a panel. The face of this panel will be flown on Long Duration Exposure Facility normal to the incident stream of oxygen atoms. Each disk will have part of its front surface masked so exposure to the atomic-oxygen reaction will be limited to selected areas, the shadowed areas being used as control surfaces in the measurements. A typical sample is an optically flat quartz disk overcoated with a film of the material of interest. These include Ag, Au, Pt, Nb, Ni, Al, C, Si, Ge, LiF, and a few engineering materials. Some materials for which the expected removal rate is high, such as carbon, will be solid disks rather than thin films. R.J.F.

N84-24637*# Michigan Univ., Ann Arbor.
INFLUENCE OF EXTENDED EXPOSURE IN SPACE ON MECHANICAL PROPERTIES OF HIGH-TOUGHNESS GRAPHITE-EPOXY COMPOSITE MATERIAL (A0019) c24
David K. Felbeck *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 19-20 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

Graphite-epoxy composites are promising candidates for structural use in space vehicles because of their high strength and elastic modulus properties. The problem of low fracture toughness was solved by use of recently developed techniques of intermittent interlaminar bonding. Before this material can be adapted for space use, however, confidence must be gained that its mechanical properties are not degraded by exposure to the space environment. The objective of this experiment is to test the effect of extended exposure to a space environment on the mechanical properties of a specially toughened T300/5208 graphite-epoxy composite material. Specimens made by recently developed techniques of intermittent interlaminar bonding will be exposed and afterward tested for fracture toughness, tensile strength, and elastic modulus. The approach of this experiment is to provide a frame on which the specimens can be mounted with their flat sides normal to the Long Duration Exposure Facility radius, each specimen with an unobstructed exposure of about 2 pi sr. The specimens will be mounted so that they neither fracture from high stress nor fail from excessive heating during launch and return. R.J.F.

N84-24638*# Grumman Aerospace Corp., Bethpage, N.Y.
EFFECT OF SPACE ENVIRONMENT ON SPACE-BASED RADAR PHASED-ARRAY ANTENNA (A0133) c32
Richard J. Delasi, Martin L. Rossi, James B. Whiteside, Martin Kesselman, Ronald L. Heuer, and Frederick J. Kuehne *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 21-23 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20N

Kapton polyimide film was selected as the baseline material for the Grumman spce based radar (SBR) concept. To gain the requisite confidence for long-term service durability, it is desirable to subject material specimens as well as a portion of the SBR antenna directly to the combined space environment and compare property degradation to that caused by laboratory simulation. The overall objective of this program is to evauate the effect of the space environment on polymeric materials currently being considered for the Grumman SBR Phased-Array Antenna. Degradation mechanisms caused by thermal cycling, ultraviolet and charged-particle irradiation, applied load, and high-voltage plasma interaction will be evaluated. The experiment occupies a 6-in.-deep end corner tray located on the space end of the Long Duration Exposure Facility and consists of both passive and active parts. The passive part addresses the effect of environment and stress on the dimensional stability spliced and continuous Kapton, both plain and reinforced. The active part will study the interaction of high voltage and low-Earth-orbit plasma. R.J.F.

N84-24639*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE EXPOSURE OF COMPOSITE MATERIALS FOR LARGE SPACE STRUCTURES (A0134) c24
Wayne S. Slemp *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 24-26 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

The objective of this experiment is to evaluate the effects of the near-Earth orbital environment on the physical and chemical properties of laminated continuous-filament composites and composites resin films for use in large space structures and

advanced spacecraft. The experiment is passive and occupies about one-half of a 6-in.-deep peripheral tray. Specimens of composite materials and polymeric and resin films are arranged above and below the experiment mounting plate to enable both exposure and nonexposure to sunlight. This provides a comparison of the effects of ultraviolet plus vacuum plus thermal cycling and those of vacuum plus thermal cycling on these materials. The experiment tray is thermally isolated from the Long Duration Exposure Facility structure to allow the material specimens to experience a wide range of thermal cycles. Tensile and compression specimens will be used to evaluate the laminated composite materials. A number of the specimens are precut and ready for testing after space exposure, whereas other specimens will be prepared from larger samples. R.J.F.

N84-24640*# MATRA Service Aerodynamique, Le Chesnay (France). Space Div.
EFFECT OF SPACE EXPOSURE OF SOME EPOXY MATRIX COMPOSITES ON THEIR THERMAL EXPANSION AND MECHANICAL PROPERTIES (A0138-8) **c24**
Robert Elberg *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 27-31 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

This experiment has three objectives. The first and main objective is to detect a possible variation in the coefficient of thermal expansion of composite samples during a 1-year exposure to the near-Earth orbital environment. A second objective is to detect a possible change in the mechanical integrity of composite products, both simple elements and honeycomb sandwich assemblies. A third objective is to compare the behavior of two epoxy resins commonly used in space structural production. The experimental approach is to passively expose samples of epoxy matrix composite materials to the space environment and to compare preflight and postflight measurements of mechanical properties. The experiment will be located in one of the three FRECOPA (French cooperative payload) boxes in a 12-in.-deep peripheral tray that contains nine other experiments from France. The FRECOPA box will protect the samples from contamination during the launch and reentry phases of the mission. The coefficients of thermal expansion are measured on Earth before and after space exposure. R.J.F.

N84-24641*# Aerospatiale Etablissement des Mureaux (France).
THE EFFECT OF THE SPACE ENVIRONMENT ON COMPOSITE MATERIALS (A0138-9) **c24**
Michel Parcelier *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 32-34 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

The objective is to test different types of materials (laminates, thermal coatings, and adhesives) to determine their actual useful lifetime. These experiments will also make is possible to integrate the histories of the thermal and mechanical characteristics into models of the composite structures. The experiment is passive and is located in one of the boxes in a 12-in.-deep peripheral tray with nine other experiments from France. The box will provide protection for the samples from contamination during the launch and reentry phases of the Long Duration Exposure Facility mission. The experiment revolves around four themes of study: thermal coatings, adhesives, dimensional stability, and mechanical characteristics. The various materials will be arranged in six levels within the box, so only the first level will be subjected to direct solar radiation. Each level will consist of plates from which test specimens will be cut after the mission. R.J.F.

N84-24642*# Societe Nationale Industrielle Aerospatiale, Cannes (France).
MICROWELDING OF VARIOUS METALLIC MATERIALS UNDER ULTRAVACUUM (A0138-10) **c26**
Jean Pierre Assie *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 35-37 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11F

In the space vacuum environment, the spacecraft mechanisms are liable to sustain damaging effects from microwelds due to molecular diffusion of the spacecraft constituent metals. Such microwelds result in a continuing increase in the friction factors and are even liable to jam the mechanisms altogether. The object of this experiment is to check the metal surfaces representative of the mechanism constituent metals (treated or untreated, lubricated or unlubricated) for microwelds afater an extended stay in the space environment. The experimental approach is to passively expose inert metal specimens to the space vacuum and to conduct end-of-mission verification of the significance of microwelds between various pairs of metal washers. The experiment will be located in one of the FRECOPA boxes in a 12-in. -deep peripheral tray that contains nine other experiments from France. R.J.F.

N84-24643*# Rockwell International Corp., Tulsa, Okla.
EVALUATION OF LONG-DURATION EXPOSURE TO THE NATURAL SPACE ENVIRONMENT ON GRAPHITE-POLYIMIDE AND GRAPHITE-EPOXY MECHANICAL PROPERTIES (A0175) **c24**
J. Howard Powell and Douglas W. Welch *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 38-40 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

The primary objective of this experiment is to accumulate the needed operational data associated with the exposure of graphite-polyimide and graphite-epoxy material to the environments of space. The experiment will be mounted in two 3-in.-deep peripheral trays. Graphite-polyimide specimens will occupy 1 1/3 trays and the graphite-epoxy specimens will occupy two-thirds of a tray. The experiment approach requires two matched sets of specimens with traceable records that are maintained for materials processing and specimen quality. After fabrication, one set of each test specimen will be sectioned and structurally tested to serve as a data baseline. After the flight, the other set of specimens will undergo extensive measurements of mechanical properties for comparison with the original data baseline. Structural testing of the graphite-polyimide specimens will provide strength and elastic data in tension, compression, and shear. Transverse tension microcracking and crack propagation will be evaluated by photomicroscopy. Structural testing of the graphite-epoxy specimens will include verification of laminate, core, adhesive, and fatigue properties as applied to the design and analysis of the payload bay door. Microcracking and crack propagation will also be analyzed by photomicroscopy. R.J.F.

N84-24644*# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
THE EFFECT OF SPACE ENVIRONMENT EXPOSURE ON THE PROPERTIES OF POLYMER MATRIX COMPOSITE MATERIALS (A0180) **c24**
R. C. Tennyson and J. S. Hansen *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 41-43 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

The objective of this experiment is to determine the effect of various lengths of exposure to a space environment on the mechanical properties of selected commercial polymer matrix composite materials. Fiber materials will include graphite, boron, S-glass, and PRD-49. The mechanical properties to be investigated are orthotropic elastic constants, strength parameters (satisfying the tensor polynomial relation), coefficients of thermal expansion, impact resistance, crack propagation, and fracture toughness. In addition, the effect of laminate thickness on property changes will also be investigated. R.J.F.

N84-24645*# Aerospace Corp., El Segundo, Calif.
SPACE ENVIRONMENT EFFECTS ON SPACECRAFT MATERIALS (M0003) c24
Paul Schall *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 44-48 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

The immediate objectives of this experiment are to understand changes in the properties and structure of materials after exposure to the space environment and to compare these changes with predictions based on laboratory experiments. The experiment consists of 19 subexperiments involving a number of DOD laboratories and contractor organizations. In general, the experimental approach with each of the subexperiments will involve comparison of preflight and postflight analyses. Typical analyses will include the measurement of optical properties (reflectance, transmittance, and refractive index), and macrophysical properties. In addition to measuring changes in the macroscopic properties of the returned specimens, microstructural properties will also be examined. Thus, it may be possible to increase our understanding of the changes induced by the environment. This increased understanding can then be used to predict the performance of materials based on knowledge of the space environment and the results of laboratory tests. This experiment will be a coopperative effort and will provide an opportunity for DOD space programs and laboratories to evaluate materials and components after long exposures to the space environment. R.J.F.

N84-24646*# Texas A&M Univ., College Station.
BALLOON MATERIALS DEGRADATION (S1006) c27
David H. Allen *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 49-51 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

The objective of this experiment is to assess the effects of long-term exposure of candidate balloon films, tapes, and lines to the hostile environment above the Earth's atmosphere. Degradation of mechanical and radiometric properties will be observed by a series of tests on exposed materials. The experiment is passive and will test candidate balloon films, tapes, and lines. The experiment will occupy one-third of a 3-in.-deep peripheral tray. Two additional identical sets of material will be prepared. The first set will be tested immediately and the second will be held in a controlled environment until the recovery of the samples placed on orbit. Tests will then be performed on this second set to determine any effects of aging. The specimens that are recovered from the Long Duration Exposure Facility will also be tested and the effects of long-duration exposure noted. In addition to these specimens, another set of specimens will be exposed at an accelerated exposure facility and the results will be compared with those of specimens exposed in situ. R.J.F.

N84-24647*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
THERMAL CONTROL COATINGS EXPERIMENT (A0138-6) c27
A. Paillous and J. C. Guilaumon (CNES) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 52-53 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

The objectives of this LDEF experiment are to verify the validity of space environment simulation performed in the laboratory in order to measure the stability of the thermo-optical properties of thermal control coatings, and to compare the behavior in space of some materials for which the available ultraviolet solar simulation is inadequate (especially in the far ultraviolet). The experimental approach is to passively expose samples of the thermal coatings of interest. These coatings include black paint, aluminum paint, white paint, a solar absorber, an optical surface reflector, second surface mirrors, metal coatings, and silica fabrics. Preflight and postflight measurements of thermo-optical properties will be compared to determine the effects of space environment exposure. M.G.

N84-24648*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPOSURE OF SPACECRAFT COATINGS (S0010) c27
Wayne S. Slemp *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 54-56 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

The objectives of this LDEF experiment are to determine the effects of both the Shuttle-induced environment and the space radiation environment on selected sets of spacecraft thermal control coatings. The experimental approach is to passively expose samples of thermal control coatings to Shuttle-induced and space radiation environments and to return the samples for postflight evaluation and comparison with preflight measurements to determine the effects of the environmental exposure. Optical measurements of the samples will include total normal emittance and spectral reflectance. The experiment will utilize a 6 in. deep peripheral tray and an experiment exposure control canister (EECC). The EECC will provide protection for some of the samples against exposure to the launch and reentry environments. The EECC will be programmed to open about 2 weeks after LDEF deployment and close pior to LDEF retrieval by the Shuttle and reentry. Some samples will not be housed in the EECC and will be exposed to the Shuttle-induced environment during launch and reentry. Comparison of the data from these samples with data from samples in the EECC will yield information about possible contamination induced degradation effects. M.G.

N84-24649*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THERMAL CONTROL SURFACE EXPERIMENT (S0069) c27
Donald R. Wilkes and Harry M. King *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 57-61 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

The objectives of this LDEF experiment are to determine the effects of the near Earth orbital environment and the Shuttle induced environment in spacecraft thermal control surfaces. Spectral reflectance measurements will be obtained and used to differentiate between different solid state damage mechanisms of environmental damage to separate the effects of contamination from those of natural environment damage, and for comparison and correlation with laboratory test data. M.G.

N84-24650*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION-BEAM-TEXTURED AND COATED SURFACES EXPERIMENT (S1003) c27
Michael J. Mirtich, Jr. *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 62-65 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

The objective of this LDEF experiment is to measure the effects of exposure to the shuttle launch and near Earth space environments on the optical properties of ion beam textured high absorptance solar thermal control surfaces, the optical and electrical properties of ion beam sputtered conductive solar thermal control surfaces, and the weight loss of ion beam deposited oxide polymer films. The various types of surfaces to be tested include six major categories: (1) ion beam textured surfaces suitable for space solar thermal (solar concentration) application; (2) painted and/or state of the art solar thermal surfaces; (3) ion beam sputtered conductive coatings for thermal and space charge control (e.g., indium-oxide coated metalized FEP Teflon); (4) ion beam sputtered conductive coated solar sail materials for space charge control and cooling through emittance; (5) micrometeoroid sensitive samples whose optical properties change only as a result of micrometeoroid impact; and (6) Kapton coated with oxide polymer

films to minimize oxygen degradation at near Earth orbit altitudes. M.G.

N84-24651*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
CASCADE VARIABLE-CONDUCTANCE HEAT PIPE (A0076) **c34**
Michael G. Grote and Leslie D. Calhoun, II *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 66-69 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20D

The objective is to verify the capability of a cascade variable conductance heat pipe (CVCHP) system to provide precise temperature control of long life spacecraft without the need for a feedback heater or other power sources for temperature adjustment under conditions of widely varying power input and ambient environment. Solar energy is the heat source and space the heat sink for thermally loading two series connected variable conductance heat pipes. Electronics and power supply equipment requirements are minimal. A 7.5 V lithium battery supplies the power for thermistor type temperature sensors for monitoring system performance, and a 28 V lithium battery supplies power for valve actuation. M.G.

N84-24652*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW-TEMPERATURE HEAT PIPE EXPERIMENT PACKAGE (HEPP) FOR LDEF (S1001) **c34**
Roy McIntosh, Jr., Stanford Ollendorf, and Craig R. McCreight (NASA. Ames Research Center) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 70-73 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20D

The principal objectives of the experiment are to determine zero-g start-up performance for conventional and diode low temperature heat pipes, to evaluate heat pipe performance in zero-g for an extended period of time, to determine zero-g transport capability of each heat pipe, and to determine diode operation, including forward conductance, turndown ratio, and transient behavior. Two heat pipes, a fixed conductance transporter heat pipe and a thermal diode heat pipe, are coupled with a radiant cooler system. Both pipes are charged with ethane. Also integrated with the radiator is a phase change material (PCM) canister which provides temperature stability during transport tests. N-heptane, which has a melting/freezing point of 182 K, is used as the PCM. The high heat capacity (28 W-hr of latent heat) provided by the canister permits high power heat pipe testing at constant temperature. M.G.

N84-24653*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TRANSVERSE FLAT-PLATE HEAT PIPE EXPERIMENT (S1005) **c34**
James W. Owen and Fred Edelstein (Grumman Aerospace Corp.) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 74-77 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20D

The objective of this experiment is to evaluate the zero-g performance of a number of transverse flat plate heat pipe modules. Performance will include the transport capability of the pipes, the temperature drop, and the ability to maintain temperature over varying duty cycles and environments. Additionally, performance degradation, if any, will be monitored over the length of the Long Duration Exposure Facility (LDEF) mission. This information is necessary if heat pipes are to be considered for system designs where they offer benefits not available with other thermal control techniques. M.G.

N84-24654*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LDEF THERMAL MEASUREMENTS SYSTEM (P0003) **c35**
Robert F. Greene, Jr. *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 78-81 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14B

Many of the passive experiments flying on LDEF will be significantly enhanced if data are available postflight to indicate the temperature time histories of test materials and other specimens exposed in the experiments. The baseline LDEF approach was to provide postflight calculated temperature histories of experiment boundaries and solar flux data for the mission, which can in turn be used by each investigator to calculate the temperature time histories for critical experiment components. Without in-flight temperature measurements, a substantial uncertainty will exist in the calculated temperatures. The data measured by the thermal measurement system (THERM) will significantly improve postflight knowledge of temperatures experienced by LDEF experiments. The THERM data will also be valuable in validating the LDEF thermal design concept and in providing better design data for experimenters on future LDEF missions. The objectives of this experiment are to determine the history of the interior average temperatures of the LDEF for the total orbital mission and to measure the temperatures of selected components and thermal boundary conditions. M.G.

N84-24655*# TRW Space Technology Labs., Redondo Beach, Calif.
SPACE PLASMA HIGH-VOLTAGE DRAINAGE EXPERIMENT (A0054) **c75**
William W. L. Taylor and Gene K. Komatsu *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 82-85 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20I

The objectives of this experiment are to place large numbers of dielectric samples under electric stress in space; to determine their in-space current drainage behavior; to recover, inspect, and further test these samples in laboratory facilities; and finally to specify allowable electric stress levels for these materials as applied to solar-array and thermal control coatings for prolonged exposure in space. These findings, in turn, will pace the design of encapsulated, lightweight, high-voltage solar arrays as well as the development of coating materials for spacecraft operation in energetic charged-particle environments such as that experienced at geosynchronous altitudes during magnetic substorms. M.G.

N84-24656*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR-ARRAY-MATERIALS PASSIVE LDEF EXPERIMENT (A0171) **c44**
Ann F. Whitaker, Charles F. Smith, Jr., Leighton E. Young, Henry W. Brandhorst, Jr., A. F. Forestieri, Edward M. Gaddy, James A. Bass, and Paul M. Stella *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 86-87 Prepared in cooperation with NASA. Lewis Research Center and NASA. Goddard Space Flight Center and JPL (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 10A

The objective of this experiment is to evaluate the synergistic effects of the space environment on various solar-array materials, including solar cells, cover slips with various antireflectance coatings, adhesive, encapsulants, reflector materials, substrate strength materials, mast and harness materials, structural composites, and thermal control treatments. The experiment is passive and consists of an arrangement of material specimens mounted in a 3-in.-deep peripheral tray. The effects of the space environment on the specimens will be determined by comparison of preflight and postflight measurements of mechanical, electrical, and optical properties. M.G.

N84-24657*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED PHOTOVOLTAIC EXPERIMENT (S0014) **c44**

Henry W. Bradhorst, Jr. and A. F. Forestieri *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 88-90 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 10A

The advanced photovoltaics-related experiments for investigating a portion of the solar spectrum and the effect of the space environment on photovoltaics. The information will be used to provide correlation between space and ground testing and also to provide for more accurate performance measurement in the laboratory. Specific objectives of these experiments are to provide information on the performance and endurance of advanced and conventional solar cells, to improve reference standards for photovoltaic measurements, and to measure the energy distribution in the extraterrestrial solar spectrum. Data to be obtained will include temperatures and short-circuit current of the samples. Six-point current-voltage (I-V) characteristics will be obtained for selected samples. These data will be recorded once a day during the flight. Orbit data will be correlated with preflight and postflight measurement of the samples. M.G.

N84-24658*# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Space Div.
INVESTIGATION OF CRITICAL SURFACE DEGRADATION EFFECTS ON COATINGS AND SOLAR CELLS DEVELOPED IN GERMANY (S1002) **c44**
Ludwig Preuss *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 91-93 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 10A

Various coatings developed in the FRG (i.e., second-surface mirrors with interference filters with and without conductive layers, conductive layers on solar-cell covers, and selective absorber coatings) have been qualified by accelerated tests under simulated space environment conditions. Experiments with coatings and solar cells have shown, however, that the thermo-optical behavior can differ considerably when performed on the ground and in space because of the great difficulty in simulating the space environment realistically. The objective of this experiment is to qualify these coatings under realistic space environment conditions. In addition, the experiment will provide design criteria, techniques, and test methods to insure control of the combined space and spacecraft environment effects, such as contamination, electrical conductance, and optical degradation, on the coatings. Data to be measured include the temperature of the samples, the electrical resistance of the conductive layers of the samples, the short circuit current of the solar-cell modules, and the deposition of contaminants on the samples (using quartz crystal microbalances (QCM's)). M.G.

N84-24659*# Morton Thiokol, Brigham City, Utah.
SPACE AGING OF SOLID ROCKET MATERIALS (P0005) **c20**
Leon L. Jones and R. B. Smalley, Jr. *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 94-96 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 21H

The objective of this experiment is to determine the effects of long-term orbital exposure on the materials used in solid-rocket space motors. Specifically, structural materials and propellants from the STAR/PAM-D series motors and the PAM DII/IPSM-II motors will be tested, as well as advanced composite case and nozzle materials planned for future use. The experiment approach is to expose samples of solid-rocket propellant, liner, insulation, case, and nozzle specimens to the space environment and to compare preflight and postflight measurements of various mechanical, chemical, and ballistic properties. M.G.

N84-24660*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTERSTELLAR-GAS EXPERIMENT (A0038) **c90**
Don L. Lind, Johannes Geiss (Bern Univ.), and Fritz Buehler *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 98-100 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The objectives of this experiment are to collect and isotopically analyze interstellar gas atoms around the orbit of the Earth for the purpose of obtaining new data relevant to understanding nucleosynthesis, and to study the dynamics of the interstellar wind inside the heliosphere and the isotopic composition of the interstellar medium outside the heliosphere. The experiment hardware will act as a set of simple cameras with high-purity copper-beryllium collecting foils serving as the film. The experiment housing will mount and thermally control the foils, establish the viewing angles and viewing direction, provide baffling to reject ambient neutral particles, provide a voltage grid to reject ionospheric charged particles, sequence collecting foils, control exposure times, and protect the foils from contamination during the deployment and retrieval of the LDEF. After being returned to Earth, the entrapped atoms can be analyzed by mass spectroscopy to determine the relative abundance of the different isotopes of helium and neon. An attempt will also be made to detect argon. M.G.

N84-24661*# Dublin Inst. for Advanced Studies (Ireland).
A HIGH-RESOLUTION STUDY OF ULTRA-HEAVY COSMIC-RAY NUCLEI (A0178) **c93**
Denis OSullivan, Alex Thompson, Cormac OCeallaigh, Vicente Domingo (ESA), and Klaus-Peter Wenzel (ESA) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 101-104 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The main objective of the experiment is a detailed study of the charge spectra of ultraheavy cosmic-ray nuclei from zinc ($Z = 30$) to uranium ($Z = 92$) and beyond using solid-state track detectors. Special emphasis will be placed on the relative abundances in the region $Z >$ or - 65, which is thought to be dominated by r-process nucleosynthesis. Subsidiary objectives include the study of the cosmic-ray transiron spectrum a search for the postulated long-lived superheavy (SH) nuclei ($Z >$ or $=$ 110), such as (110) SH294, in the contemporary cosmic radiation. The motivation behind the search for super-heavy nuclei is based on predicted half-lives that are short compared to the age of the Earth but long compared to the age of cosmic rays. The detection of such nuclei would have far-reaching consequences for nuclear structure theory. The sample of ultraheavy nuclei obtained in this experiment will provide unique opportunities for many tests concerning element nucleosynthesis, cosmic-ray acceleration, and cosmic-ray propagation. M.G.

N84-24662*# Naval Research Lab., Washington, D. C. Lab. for Cosmic Ray Physics.
HEAVY IONS IN SPACE (M0001) **c93**
James H. Adams, Jr., Rein Silberberg, and C. H. Tsao *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 105-108 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The ojectives are to investigate three components of heavy nuclei in space: (1) a recently observed anomalous component of low-energy nuclei of N, O, and Ne; (2) the heavy nuclei in the Van Allen radiation belts; and (3) the UH nuclei ($Z > 30$) of the galactic radiation. The study of the anomalous flux of N, O, and Ne nuclei in the unexplored energy region above 100 MeV/u is expected to provide new insights into the source of this component. Its observation in this experiment will confirm that these ions are singly charged. Knowledge of the energy spectra of the heavy nuclei observed in the Van Allen belts is expected to enhance the understanding of the origin of the belts (e.g., injection and local acceleration pocesses). The observation of these heavy ions could show, for the first time, that low-energy particles of

extraterrestrial origin can diffuse to the innermost parts of the magnetosphere. Measurements of the UH component are expected to contribute information concerning its source, interstellar propagation, and the galactic storage time. M.G.

N84-24663*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TRAPPED-PROTON ENERGY SPECTRUM DETERMINATION (M0002-1) **c93**
Frederick J. Rich (AFGL), Irving Michael (AFGL), Gerald J. Fishman, Paul L. Segalyn (Army Materials and Mechanics Research Center), Peter J. McNulty (Clarkson College of Technology), Y. V. Rao (Emmanuel College), and Christopher E. Laird (Univ. of Eastern Kentucky) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 109-112 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The objective of this experiment is to measure the flux and energy spectrum of protons with energies of 1 to MeV. These protons are trapped on the Earth's magnetic field lines as part of the inner radiation belt, or Van Allen zone. The proton will be encountered predominantly in the South Atlantic anomaly at a 90 deg pitch angle. Author

N84-24664*# Kiel Univ. (West Germany). Inst. for Pure and Applied Nuclear Physics.
MEASUREMENT OF HEAVY COSMIC-RAY NUCLEI ON LDEF (M0002-2) **c93**
Rudolf Beaujean, Wolfgang Enge, Georg Siegmon
In NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 113-114 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The objective of this experiment is to measure the elemental and isotopic abundamces of heavy cosmic-ray nuclei with nuclear charge Z equal to or greater than 3. The chemical and energy spectra will be measured for particles that have energies in the range from 20 to 1000 MeV per atomic mass unit. Two points of great interest are geomagneticaly forbidden cosmic-ray particles and heavy ions of the trapped radiation. Author

N84-24665*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LINEAR ENERGY TRANSFER SPECTRUM MEASUREMENT EXPERIMENT (P0006) **c93**
Eugene V. Benton (San Francisco Univ.) and Thomas A. Parnell *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 115-116 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The linear energy transfer (LET) is the energy deposited per unit path length of charged particle traversing matter. For estimating the rate of damage from single-hit phenomena, the quantity that best combines the radiation environment, orbital situation, and spacecraft shielding is the linear energy transfer (LET) spectrum at the device location. This experiment will measure the LET spectrum behind different shielding configurations for approximately 1 year. The shielding will be increased in increments of approximately 1 G/sq cm up to a maximum shieldng of 16 G/sq cm. In addition to providing critical information to future spacecraft designers, these measurements will also provide data that will be extremely valuable to other experiments on LDEF. B.W.

N84-24666*# Kent Univ., Canterbury (England).
MULTIPLE-FOIL MICROABRASION PACKAGE (A0023) **c35**
J. A. M. McDonnell, D. G. Ashworth, W. C. Carey, R. P. Flavill, and R. C. Jennison *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 117-120 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14B

The specific scientific objectives of this experiment are to measure the spatial distribution, size, velocity, radiance, and composition of microparticles in near-Earth space. The technological objectives are to measure erosion rates resulting from microparticle impacts and to evaluate thin-foil meteor 'bumpers'. The combinations of sensitivity and reliability in this experiment will provide up to 1000 impacts per month for laboratory analysis and will extend current sensitivity limits by 5 orders of magnitude in mass. Author

N84-24667*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
STUDY OF METEOROID IMPACT CRATERS ON VARIOUS MATERIALS (A0138-1) **c39**
J. C. Mandeville *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 121-123 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20K

Interplanetary dust particles (micrometeoroids) are expected to form well-defined craters upon impacting exposed material in space. Studying the frequency and features of these craters will provide data on the mass-flux distribution of micrometeoroids and, to a lesser extent, on the velocity magnitude and direction. This experiment will study impact craters produced by micrometeoroids on selected materials (metals and glasses in the form of thick targets) to obtain valuable technological and scientific data. Specifically, the studies will focus on determining micrometeoroid composition and mass-flux distribution. Analyses will also be made on the distribution of impact velocity vectors. B.W.

N84-24668*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
ATTEMPT AT DUST DEBRIS COLLECTION WITH STACKED DETECTORS (A0138-2) **c90**
J. C. Mandeville *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 124-126 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The primary objective of this experiment is to investigate the feasibility of future missions of multilayer thin-film detectors acting as energy sorter to collect micrometeoroids, if not in their original shape, at least as fragments suitable for chemical analysis. It is expected that this kind of particle collector will help in solving one of the most puzzling topics in cosmic-dust studies: the mineralogical and chemical composition of the particles. This is a matter of great interest in the study of the origin and evolution of the solar system. Author

N84-24669*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE CHEMISTRY OF MICROMETEOROIDS (A0187-1) **c91**
Friedrich Hoerz, David S. McKay, Donald A. Morrison, Donald E. Brownlee (Washington Univ.), and Robert M. Housley (Rockwell International) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 127-130 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The prime objective of this experiment is to obtain chemical analyses of a statistically significant number of micrometeoroids. These data will then be compared with the chemical composition of meteorites. Secondary objectives of the experiment relate to density, shape, mass frequency, and absolute flux of micrometeorids as deduced from detailed crater geometrics (depth) diameter, and plane shape, and number of total events observed. Author

N84-24670*# McDonnell Center for Space Sciences, St. Louis, Mo.
CHEMICAL AND ISOTOPIC MEASUREMENTS OF MICROMETEOROIDS BY SECONDARY ION MASS SPECTROMETRY

(A0187-2) c91
John H. Foote, Patrick D. Swan, Robert M. Walker, Ernst K. Zinner, Dieter Bahr, Hugo Fechtig, Elmar Jessberger, Eduard Igenbergs, Uwe Kreitmayr, Heribert Kuczera et al *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 131-134 refs Prepared in cooperation with Max-Planck-Inst. fuer Kernphysik, Heidelberg and Technische Univ., Munich and Ernst-Mach Inst., Freiburg and Dornier-Werke G.m.b.H., Friedrichshafen (West Germany) (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The objective of this experiment is to measure the chemical and isotopic composition of interplanetary dust particles of mass greater than 10 to the minus 10 power G for most of thermator elements expected to be present. Author

N84-24671*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTERPLANETARY DUST EXPERIMENT (A0201) c90
S. Fred Singer (Virginia Univ.), John E. Stanley (Virginia Univ.), Philip C. Kassel, Jr., and J. J. Wortman (North Carolina Univ.) *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 134-135 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The objective of this experiment is to study interplanetary dust, variously referred to as cosmic dust, cometary dust, zodiacial dust, or meteoric dust particles. Specific objectives are to obtain information regarding particle mass and velocity, and to undertake correlative analyses with other experiments, both on LDEF or near the time of the LDEF flight. Author

N84-24672*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE DEBRIS IMPACT EXPERIMENT (S0001) c90
Donald H. Humes *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 136-137 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

The specific objectives of this experiment are to establish the population and size distribution of meteoroids in the mass range from 10 to the minus 10 power to 10 to the minus 4 power G, to establish the current population of man-made debris in the same mass range, and to obtain data on the physical properties (composition and density) of meteoroids. Author

N84-24673*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
METEOROID DAMAGE TO SPACECRAFT c18
In its Long Duration Exposure Facility (LDEF) Feb. 1984 p 138 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 22B

The objective of this experiment is to obtain examples of meteoroid impact damage to typical spacecraft components, and by so doing to help establish design approaches to minimize meteoroid damage effects to future spacecraft. The results of the complete inspection of the LDEF will complement and extend the data obtained from specific meteoroid experiments flying in LDEF trays. Author

N84-24674*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Flight Medicine.
FREE-FLYER BIOSTACK EXPERIMENT c51
Horst Buecker *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 139-145 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 06C

The free-flyer biostack experiment is part of a radiobiological space research program that includes experiments in space as well as in accelerators on Earth. The program has been specially designed to increase knowledge concerning the importance, effectiveness, and hazards of the structured components of cosmic radiation to man and to any biological specimen in space. Up to now, our understanding of the ways in which HZE particles might affect biological matter is based on a few spaceflight experiments from the last Apollo missions and on the limited data available from heavy-ion irradiation from accelerators. In the near future, accelerators capable of accelerating particles up to higher atomic numbers and higher energies will promote increased activity in ground-based studies on biological effects of HZE particles. Comparison of data from such irradiation experiments on Earth with those from an actual spaceflight experiment will show any potential influence of the inevitably attendant spaceflight factors (e.g., weightlessness) on the radiobiological events. B.W.

N84-24675*# Park (George W.) Seed Co., Inc., Greenwood, S.C.
SEEDS IN SPACE EXPERIMENT (P0004-1) c51
George B. Park, Jr. and Jim A. Alston *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 146-147 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 06C

The specific objectives of this experiment are to evaluate the effects of space radiation on the survivability of seed stored in space under sealed and vented conditions and to determine possible resulting mutants and changes in mutation rates. Author

N84-24676*# National Aeronautics and Space Administration, Washington, D. C.
SPACE-EXPOSED EXPERIMENT DEVELOPED FOR STUDENTS c51
Doris K. Grigsby *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 148-150 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 06C

This experiment will offer students the opportunity to evaluate the survivability of seeds stored in the space environment and to determine possible mutants and changes in the mutation rate which may occur. The objectives of this experiment are to involve a very large number of students in a national project to generate interest in science and related disciplines; to offer students from the elementary through the university level an opportunity to participate in a first-hand experiment with materials flown in space; to permit active involvement in classroom experiment design, decision making, data gathering, and comparison of results; and to emphasize a multidisciplinary approach to the project involving subject areas other than science. B.W.

N84-24677*# Georgia Inst. of Tech., Atlanta.
HOLOGRAPHIC DATA STORAGE CRYSTALS FOR LDEF (A0044) c35
W. Russell Callen and Thomas K. Gaylord *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 152-153 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14E

Electro-optic holographic recording systems were developed. The spaceworthiness of electro-optic crystals for use in ultrahigh capacity space data storage and retrieval systems are examined. The crystals for this experiment are included with the various electro-optical components of LDEF experiment. The effects of long-duration exposure on active optical system components is investigated. The concept of data storage in an optical-phase holographic memory is illustrated. E.A.K.

N84-24678*# Reading Univ. (England). Dept. of Cybernetics.
EXPOSURE TO SPACE RADIATION OF HIGH-PERFORMANCE INFRARED MULTILAYER FILTERS AND MATERIALS TECHNOLOGY EXPERIMENTS (A0056) c74
John S. Seeley, R. Hunneman, A. Whatley, and Derek R. Lipscombe (British Aerospace Corp.) *In* NASA. Langley Research Center

Long Duration Exposure Facility (LDEF) Feb. 1984 p 154-157 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

Infrared multilayer interface filter which were used in satellite radiometers were examined. The ability of the filters to withstand the space environment in these applications is critical. An experiment on the LDEF subjects the filters to authoritative spectral measurements following space exposure to ascertain their suitability for spacecraft use and to permit an understanding of degradation mechanisms. The understanding of the effects of prolonged space exposure on spacecraft materials, surface finishes, and adhesive systems is important to the spacecraft designer. Materials technology experiments and experiment on infrared multilayer filters are discussed. E.A.K.

N84-24679*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF SPACE EXPOSURE ON PYROELECTRIC INFRARED DETECTORS (A0135) c74
James B. Robertson, Ivan O. Clark, and Roger K. Crouch *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 158 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

The effects of long-duration space exposure and launch environment on the performance of pyroelectric detectors which is important for the prediction of performance degradation, setting exposure limits, or determining shielding requirements was investigated. Air pollution monitoring and thermal mapping of the Earth, which includes the remote sensing of aerosols and limb scanning infrared radiometer projects, requires photodetection in the 6- to 20 micro m region of the spectrum. Pyroelectric detectors can detect radiation in the 1- to 100 micro m region while operating at room temperature. This makes tahe pyroelectric detector a prime candidate to fill the thermal infrared detector requirements. E.A.K.

N84-24680*# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France).
THIN METAL FILM AND MULTILAYERS EXPERIMENT (A01-38-3) c26
J. P. Delaboudiniere and J. M. Berset *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 159-160 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11F

The sources of degradation of in state of the art and newly developed components and testing the usefulness of the concept of storing experiment samples in dry nitrogen under launch and space vacuum conditions during reentry mission phase were investigated. Ultraviolet (UV) and extreme ultraviolet (EUV) experiments suffer degradations during space missions of even 1 month duration. It is suggested that the degradation is due to condensation of outgassing products, followed by solar induced polymerization, however, penetrating charged particles are also known to produce volume effects. Degradation may also start immediately after manufacturing of the component due to oxidation, moisture, or chemical corrosion by atmospheric constituents such as CO2 and SO2. When the filters are used as windows for gas absorption cells or gas filters, or when they define the instrumental bandwidth by themselves. The effects of mechanical degradation by thermal cycling and/or dust may cause a dramatic impact. E.A.K.

N84-24681*# MATRA Service Aerodynamique, Rueil-Malmaison (France). Optical Div.
VACUUM-DEPOSITED OPTICAL COATINGS EXPERIMENT (A0138-4) c74
A. Malherbe *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 161-162 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

The stability of various vacuum deposited optical coatings exposed to the space environment were analyzed. A wide range of optical components manufactured by vacuum deposition, such as metallic and multidielectric reflective coatings in the UV range, metal dielectric interference filtes in the UV and IR ranges, narrow-bandpass filters int he near-UV and visible ranges, selective metallic mirrors in the range from 1500 to 2500 A. antireflective and reflective IR coatings, beam splitters in the visible and IR ranges, and optical surface reflection (OSR) coatings were developed. Many of these components were incorporated into scientific and technical experiments flown on balloons and rockets as well as on Symphonie, Meteosate, OTS, D2-B, TIROS n, and others. It appears that these components operate successfully in flight. E.A.K.

N84-24682*# Instruments Service Aerodynamique, Longjumeau (France).
RULED AND HOLOGRAPHIC GRATINGS EXPERIMENT (A0138-5) c35
Gilbert Moreau *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 163-164 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14E

The behavior of ruled and holographic gratings with various coatings after extended exposure to the space environments was examined. The coatings and differentiating between the influences of vacuum and solar illumination were examined. In the past, several ruled and holographic gratings with various coatings were successfully flown on rocket experiments. Future utilizations of such gratings are considered for the Space Telescope and for various Spacelab projects under development. The techniques which is used to replicate gratings can also be used to obtain a wide range of lightweight optical components, including sophisticated aspherical, highly polished mirrors. E.A.K.

N84-24683*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
OPTICAL FIBERS AND COMPONENTS EXPERIMENT (A01-38-7) c74
J. Bourrieau *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 165-166 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

Fiber optics permanent damages induced by ionizing radiation after a long exposure in space and after laboratory tests were examined. Irradiation tests performed with radioactive sources (Sr90 - Y90) were validataed, computer coses used for the fluence and dose profile were verified. The performance of fiber optics waveguides in a low altitude orbit, and the origin of transmission losses in the material were dtermined. High sensitivity to ionizing radiations, however, may be a restriction for optic fiber use on satellites. Irradiation tests on these components using neutrons, gamma rays, and X-rays are carried out. Radiation damage on opticao materials, however, is strongly linked to the test conditions. E.A.K.

N84-24684*# Eppley Lab., Inc., Newport, R.I.
PASSIVE EXPOSURE OF EARTH RADIATION BUDGET EXPERIMENT COMPONENTS (A0147) c92
John R. Hickey and Francis J. Griffin *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 167-169 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

In-flight calibration for the solr and Earth flux channels was examined. Earth Radiation on Budget (ERB) channel components were exposed to the space environment and then retrieved and resubmitted to radiometric calibration after exposure. It is suggested that corrections may be applied to ERB results and information will be obtained to aid in the selection of components for future operational solar and Earth radiation budget experiments. To

assure that these high accuracy devices are measuring real variations and are not responding to changes induced by the space environment, it is desirable to test such devices radiometrically after exposure to the best approximation of the orbital environment. E.A.K.

N84-24685*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EFFECTS OF SOLAR RADIATION ON GLASSES c27
Ronald L. Nichols and Donald L. Kinser (Vanderbilt Univ.) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 170-172 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11B

The effects of solar radiation and space environment on glasses in space flight by exposing glass specimens to the space environment was determined. The occurrence of optical, mechanical, and chemical property changes was analyzed. The property changes of samples receiving differing cumulative solar radiation exposure are compared. E.A.K.

N84-24686*# Martin Marietta Labs., Baltimore, Md.
STUDY OF FACTORS DETERMINING THE RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS (A0189) c76
John D. Venables and John S. Ahearn *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 173-175 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20L

The correlation between defect cluster concentrations observed for different grades of quartz examined by transmission electron microscopy (TEM) and the electrical stability of quartz resonators exposed to complex radiation in an orbital LDEF was determined. It is demonstrated that the technique TEM provides a powerful method for studying the effect of radiation on crystalline quartz. Two factors suggest that the observed clusters may be responsible for the radiation-induced frequency drift and acoustic absorption effects associated with irradiated quartz resonators: (1) the clusters are expected to be very effective in modifying the piezoelectric properties of quartz because of the large strain fields associated with them; (2) both phenomena appear to be sensitive to the impurity concentration. It is suggested that TEM can be used to classify grades of quartz according to their suitability for use in radiation-hard resonators. This technique may identify the impurities that are responsible and thereby effect an improvement in the stability of quartz oscillators. E.A.K.

N84-24687*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
INVESTIGATION OF THE EFFECTS OF LONG-DURATION EXPOSURE ON ACTIVE OPTICAL SYSTEM COMPONENTS (S0050) c74
M. Donald Blue, James J. Gallagher, and R. G. Shackelford *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 176-179 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

The effects of long duration space exposure on the relevant performance parameters of lasers, radiation detectors, and selected optical components, was determined. The results and implications of the measurements indicating real or suspected degradation mechanisms were evaluated and guidelines, based on these results, for selection and use of components for space electro-optical systems are established. E.A.K.

N84-24688*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FIBER OPTIC DATA TRANSMISSION EXPERIMENT (S0109) c74
Alan R. Johnston and Larry A. Bergman *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 180-181 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

Fiber optic components in the space environment were examined. The ability to operate over long periods of time without degradation of performance are determined. E.A.K.

N84-24689*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
SPACE ENVIRONMENT EFFECTS ON FIBER OPTICS SYSTEMS c74
Edward W. Taylor *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 182-184 refs (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

The performance survivability of hardened fiber optic data link design for application in future spacecraft systems was assessed. The effects of space environmental conditions on link performance was analyzed. The integration and operation of new fiber optic link components exhibiting increased hardening to radiation environments is emphasized. The opportunity to expose operational fiber optic data links to an actual space environment for 6 months or longer and to retrieve the data links for analysis are discussed. Reliable design criteria for future spacecraft application, relative to the long term low dose space radiation effects as a function of temperature are outlined. E.A.K.

N84-24690*# Grumman Aerospace Corp., Bethpage, N.Y.
SPACE ENVIRONMENT EFFECTS (M0006) c12
Joseph A. Angelo, Jr., Richard G. Madonna, Lynn P. Altadonna (Perkin-Elmer), Michael D. DAgostino, Joseph Y. Chang, Robert R. Alfano, and Van L. Caplan *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 185-187 Prepared in cooperation with Air Force Technical Applications Center, Patrick AFB, Fla. and City College, New York (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 22A

The effects of long term exposure to the near Earth space environment on advanced electrooptical and radiation sensor components were examined. The effect of long duration spaceflight on the germination rate of selected terrestrial plant seeds is observed in exobiological experiments. E.A.K.

N84-24691*# Business and Technological Systems, Inc., Seabrook, Md.
POTENTIAL UTILITY OF FUTURE SATELLITE MAGNETIC FIELD DATA Final Report
Feb. 1984 32 p
(Contract NAS5-27597)
(NASA-CR-175230; NAS 1.26:175230; BTS07-84-05/rb) Avail: NTIS HC A03/MF A01 CSCL 05B

The requirements for a program of geomagnetic field studies are examined which will satisfy a wide range of user needs in the interim period between now and the time at which data from the Geopotential Research Mission (GRM) becomes available, and the long term needs for NASA's program in this area are considered. An overview of the subject, a justification for the recommended activities in the near term and long term, and a summary of the recommendations reached by the contributors is included. M.A.C.

N84-24692*# Martin Marietta Aerospace, Denver, Colo. Space and Electronics Systems Div.
SPACE STATION NEEDS, ATTRIBUTES AND ARCHITECTURAL OPTIONS STUDY. BRIEFING MATERIAL, MID-TERM REVIEW
Nov. 1982 172 p
(Contract NASw-3686)
(NASA-CR-173536; NAS 1.26:173536; SOC-SE-02-01) Avail: NTIS HC A08/MF A01 CSCL 22B

User mission requirements and their relationship to the current space transportation system are examined as a means of assuring the infusion of corporate ideas and knowledge in the

space station program. Specific tasks include developing strategies to develop user consistency; determine DOD implication and requirements; and foster industry involvement in the space station. Mission alternatives; accrued benefits; program options; system attributes and characteristics; and a recommended plan for space station evolution are covered. A.R.H.

N84-24693# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. HF-Systeme.

PRELIMINARY INVESTIGATIONS CONCERNING A 90 GHz RADIOMETER SATELLITE EXPERIMENT

Franz Heel and Helmut Kietzmann Oct. 1983 64 p refs
(DFVLR-FB-84-02) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 20,50

The preliminary investigations in this paper are aimed to realize a satellite experiment by means of a 90 GHz radiometer. Therefore, on the basis of a computer model the radiation temperatures of the object classes sand, vegetation, concrete and water are determined for different atmospheric conditions. Measurements with an uncooled airborne 90 GHz radiometer allow a quality test with respect to the model results. To accomplish the planned experiment a special null-balancing radiometer is proposed. In the case of null-balancing failure this system also can be operated as total power radiometer. This procedure reduces the probability of a complete system drop out. Author

N84-24694# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Regelung.

DESIGN OF A ROBUST MISSILE CONTROLLER BY VECTOR PERFORMANCE OPTIMIZATION

Norbert Sander (MBB, Ottobrunn, West Germany) and Rheinhold Steinhauser May 1983 138 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-84-05) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 40

A controller design procedure based on optimizing a vector performance index is applied to the problem of robust missile control. For the design the nonlinear missile model is used. Six controller designs are performed which are different either in the chosen design direction or in the underlying controller structure, respectively in the starting values of the controller coefficients when the same controller structure is used. According to the applied controller design procedure, the design results are found very systematically, where all design specifications are satisfied over a wide range of flight conditions without gain scheduling. Author

N84-24695# Research Inst. of National Defence, Stockholm (Sweden).

BASE BLEND PROJECTILES: RANGE CALCULATION PROGRAM AND EFFICIENCY COMPARISONS

Rune Hellgren Nov. 1983 62 p refs In SWEDISH; ENGLISH summary
(FOA-C-20516-D2; ISSN-0347-3694) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm KR50

Range calculation programs for projectiles including a so called base bleed unit, has been a long felt need, especially as such projectiles now are in production. These methods have gradually been developed during a ten year period in Sweden. In this paper a particular method is described in which consideration is taken to the variatioin of burning conditions in the base bleed motor. These conditions are among others depending on flight Mach number, ambient pressure and propellant properties, geometry and burning equation. In an appendix an efficiency comparison is done for different range-increasing methods. Author

N84-24696# Science Applications, Inc., San Diego, Calif. Electronic Vision Systems Div.

PROCUREMENT OF MATERIALS REQUIRED TO FABRICATE AND TEST SPACE-QUALIFIED QUADRANT PHOTO TUBES FOR THE SHAD SATELLITE SENSOR Final Report

1 Dec. 1983 12 p
(Contract N00014-82-C-0708)
(AD-A139862; SAI-83/1421) Avail: NTIS HC A02/MF A01 CSCL 22/2

The work included several related efforts: (1) The engineering design of quadrant photo tubes for the SHAD Satellite Sensor. This included establishment of the engineering design of the tube structure and components to meet space qualification requirements. (2) Establishment of a tube encapsulation technique for quadrant photo tubes for the SHAD Satellite Sensor utilizing space qualified encapsulation materials. (3) Procure all materials required to fabricate and test space-qualified quadrant photo tubes for the SHAD Satellite Sensor. GRA

N84-24697# Naval Postgraduate School, Monterey, Calif.

COMPUTER SIMULATED DEVELOPMENT OF A COMMAND TO LINE-OF-SIGHT MISSILE USING ON-OFF CONTROL M.S. Thesis

J. Y. Yeun Dec. 1983 83 p
(AD-A140041) Avail: NTIS HC A05/MF A01 CSCL 09/2

An on-off control provides a minimum time response for missile control. For application in missile control systems, it is wasteful of control effort (due to chatter) to use a ideal relay. Hence it is necessary to modify the ideal relay into a saturating linear control. The result was almost the same to that of using the ideal relay. Author (GRA)

N84-24698# Naval Postgraduate School, Monterey, Calif.

DESIGN AND ANALYSIS OF COORDINATED BANK-TO-TURN (CBTT) AUTOPILOTS FOR BANK-TO-TURN (BTT) MISSILES M.S. Thesis

I. S. Lioulis Dec. 1983 311 p
(AD-A140103) Avail: NTIS HC A14/MF A01 CSCL 16/2

This work addresses the design and analysis of the Pitch, Yaw and Roll autopilot for application to the Bank-to-Turn (BTT) missiles. At first, the linear uncoupled channels were designed and analyzed according to the desired requirements. Utilizing the uncoupled channels, the linear coupled autopilots were designed, not including the inertial, kinematic and aerodynamic cross-coupling. Then, the nonlinear CBTT autopilots were designed and analyzed, using the linear CBTT (Coordinated Bank-to-Turn) models, which now have coupled with kinematic, inertial and aerodynamic cross-coupling. The minimization of the above kinematic and inertial coupling and their effects were completed using feedbacks of angle-of-attack and rate of angle-of-attack in the Pitch autopilot. Author (GRA)

N84-24605# Engins Matra, Toulouse (France).

THE ROLE OF ONBOARD INTELLIGENCE AND OF ORBITAL SERVICING IN THE INCREASE OF SATELLITE LIFETIME [ROLE DE LINTELLIGENCE DE BORD ET DE LENTRETIEN EN ORBITE DANS LACCROISSEMENT DE LA DUREE DE VIE DES SATELLITES]

Par C. Cougnet and J. P. Sotta *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 14 p In FRENCH (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24610# Societe Nationale Industrielle Aerospatiale, Cannes (France).

OVERCOMING UNOBSERVABILITY IN 3-AXIS STABILIZATION OF SATELLITES

Lionel Passeron and Claude Bozzo (Compagnie de Signaux et d'Entreprises Electriques, Paris) *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 21 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24617# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

OPTIMIZING THE MANEUVERS OF AN OBSERVATION SATELLITE FOR RAPID OVERFLIGHT OF A PRECISE POINT ON EARTH [OPTIMISATION DES MANOEUVRES DUN SATELLITE

DOBSERVATION EN VUE DUN SURVOL RAPIDE DUN POINT DU GLOBE]
A. M. Mainguy, C. Aumasson, and S. Laffy *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 1 p In FRENCH (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24618# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
AN APPROACH TO ATTITUDE CONTROL MANEUVERS WHICH HELPS MAINTAIN ORBIT INCLINATION
W. Michael Bowles and Mark R. Altobelli *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 8 p (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-25095*# Indian Space Research Organization, Trivandrum. Space Center.
SEPARATION AND STAGING MECHANISMS FOR THE INDIAN SLV-3 LAUNCH VEHICLE
M. K. AbdulMajeed, K. Matarajan, and V. K. Krishnankutty *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 277-299 ref (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-24699*# Chrysler Corp., New Orleans, La. Structures and Mechanics Section.
PRETEST PLAN FOR A QUARTER SCALE AFT SEGMENT OF THE SRB FILAMENT WOUND CASE IN THE NSWC HYDROBALLISTICS FACILITY
Joseph A. Adoue Mar. 1984 29 p
(Contract NAS8-35017)
(NASA-CR-171028; NAS 1.26:171028; TN-SM-84-14) Avail: NTIS HC A03/MF A01 CSCL 22B

In support of preflight design loads definition, preliminary water impact scale model are being conducted of space shuttle rocket boosters. The model to be used as well as the instrumentation, test facilities, and test procedures are described for water impact tests being conducted at test conditions to simulate full-scale initial impact at vertical velocities from 65 to 85 ft/sec. zero horizontal velocity, and angles of 0,5, and 10 degrees. A.R.H.

N84-24624# Singer Co., Wayne, N. J.
THE DESIGN, SIMULATION AND DEVELOPMENTAL TESTING OF THE SPACE SHUTTLE DATA BUS SYSTEM
Albert J. Shapiro *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 22 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-24700*# Grumman Aerospace Corp., Bethpage, N.Y.
MANNED GEOSYNCHRONOUS MISSION REQUIREMENTS AND SYSTEMS ANALYSIS STUDY EXTENSION Quarterly Review
Feb. 1981 193 p
(NASA-CR-173547; NAS 1.26:173547; QR-3) Avail: NTIS HC A09/MF A01 CSCL 22B

Turnaround requirements for the manned orbital transfer vehicle (MOTV) baseline and alternate concepts with and without a space operations center (SOC) are defined. Manned orbital transfer vehicle maintenance, refurbishment, resupply, and refueling are considered as well as the most effective combination of ground based and space based turnaround activities. Ground and flight operations requirements for abort are identified as well as low cost approaches to space and ground operations through maintenance and missions sensitivity studies. The recommended turnaround mix shows that space basing MOTV at SOC with periodic return to ground for overhaul results in minimum recurring costs. A pressurized hangar at SOC reduces labor costs by approximately 50%. Author

N84-24701# TRW Defense and Space Systems Group, Redondo Beach, Calif.
VIBRATION CONTROL OF SPACE STRUCTURES VCOSS B: MOMENTUM EXCHANGE AND TRUSS DAMPENING Final Report, Aug. 1981 - Jul. 1983
L. Brady, G. Franco, L. Keranen, J. Kern, and R. Neiswander Wright-Patterson AFB, Ohio AFWAL Jul. 1983 110 p
(Contract F33615-81-C-3235; AF Proj. 2401)
(AD-A139910; AFWAL-TR-83-3075) Avail: NTIS HC A06/MF A01 CSCL 20/11

This report presents the final technical results of the TRW Vibration Control of Space Structures (VCOSS) program. Subtasks include: (1) Dynamic performance studies of a vibration controlled structure, (2) Design iterations, (3) Graphic representation of system performance (LOS errors), (4) Comparison of active controlled to stiffness controlled model. During this phase an emphasis was placed on development of control hardware and its impact on spacecraft power and weight budgets. A preliminary estimate of the implementation costs associated with the chosen design was also made. An evaluation of the selected hardware is presented. It was determined that mission requirements could be met and that the hardware necessary to achieve these requirements is essentially existing and the state of the art in nature. Based on the presented comparison between the active and the stiffness controlled models, it appears that there is a substantial payoff in active control. Author (GRA)

N84-24702# Lockheed Missiles and Space Co., Sunnyvale, Calif.
VIBRATION CONTROL OF SPACE STRUCTURES VCOSS A: HIGH AND LOW-AUTHORITY HARDWARE IMPLEMENTATIONS Final Technical Report, 15 Sep. 1981 - 15 Apr. 1983
J. N. Aubrun, C. Z. Gregory, M. G. Lyons, R. L. Kosut, and A. A. Jr. Woods Jul. 1983 277 p Prepared in cooperation with Integrated Systems, Inc., Palo Alto, CA
(Contract F33615-81-C-3220; AF Proj. 2401)
(AD-A139931; LMSC-D883019; AFWAL-TR-83-3074) Avail: NTIS HC A13/MF A01 CSCL 20/11

The report considers some hardware aspects of large space structure control implementations. Hardware and system performance requirements are overviewed, principally in the context of vibration suppression. Analytical models based on soft and stiff versions of CSDL (Charles Stark Draper Lab.) no. 2 structure are

used to evaluate vibration suppression performance for actively controlled and passive structures. The effects of hardware bandwidth limitations and system modeling errors are evaluated for the active controls case. It is shown that hardware bandwidth limitations do not pose significant control design problems. The basic elements for a hardware demonstration program to evaluate these results is given. GRA

N84-24703# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACOSS ELEVEN (ACTIVE CONTROL OF SPACE STRUCTURES), VOLUME 1 Interim Report, Nov. 1982 - Apr. 1983
T. H. Brooks, V. Mahajan, D. R. Hegg, G. J. Kissel, and H. N. McClamroch Griffiss AFB, N.Y. RADC Dec. 1983 57 p
(Contract F30602-81-C-0180; ARPA Order 3655; AF Proj. C65-5) (AD-A140025; CSDL-R-1648-Vol-1; RADC-TR-83-261-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 17/5

The overall objective of the Simulation Extensions project is to identify and quantify those generic mission, scenario and sensor parameters (as well as their interactions) which drive the performance of space-based starting IR surveillance systems. The approach taken to achieve their overall objective has proceeded along two main avenues; Simulation Enhancements, and Simulation Applications. Efforts in the Simulation Enhancements areas are directed toward generalized those models in the Draper Integrated Simulations which are too limited in scope or perhaps restricted to one particular system. In support of the Simulation Enhancements effort, work was performed (or is in progress) on models for the platform, sensor (including focal plane and signal processor), and scene. Utilizing the tools developed as a result of the Simulation Enhancements work, the Simulation Applications effort studies issues related to generic surveillance system performance drivers. Results are reported from a study which examines the effects of spectral band selection and scene local time of day on line-of-sight jitter-induced clutter leakage through the signal processor of a generic surveillance system. The CSDL prepared a deconvolution test to validate Itek's deconvolution algorithm for correcting a deformed HALO optical system. The algorithm uses the wavefront errors measured by a wavefront sensor to determine the actuator signals. This report describes a limited blind test and concludes that the algorithm successfully determines the actuator displacements from the wavefront errors provided in this test. GRA

N84-24704# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACOSS ELEVEN (ACTIVE CONTROL OF SPACE STRUCTURES), VOLUME 2 Interim Report, Nov. 1982 - Apr. 1983
T. H. Brooks, V. Mahajan, D. R. Hegg, G. J. Kissel, and H. N. McClamroch Griffiss AFB, N.Y. RADC Dec. 1983 110 p
(Contract F30602-81-C-0180; ARPA Order 3655; AF Proj. C65-5) (AD-A140026; CSDL-R-1648-Vol-2; RADC-TR-83-261-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 17/5

Volume 2 presents theoretical advances and demonstrations in vibration control against broadband disturbances and in large-angle linear tracking control for flexible optical support structures. Stability results for discrete-time vibration control are also given. The importance of active transducer selection for broadband disturbance accommodation is emphasized. An algorithm for systematically selecting actuators with high influence on the regulated variables is described, together with its theoretical foundation. The algorithm is demonstrated on the ACOSS Model No. 2 structure, obtaining minimal selections with substantially fewer actuators than controlled modes. Disturbance-rejection control designs based on these selections exhibit stability in the presence of residual modes over a frequency range well beyond that of the design model. Sampled-data control for flexible structures is examined using second-order difference equations. A sufficient condition for geometric stability with velocity output feedback requiring non-colocation of actuators and sensors is obtained. Non-colocation reduces to colocation as the sampling period converges to zero. Optimal large-angle slew for linear tracking and terminal convergence is considered. Explicit solutions as a function of matrices satisfying linear algebraic equations are obtained. Demonstrations on a rotating rigid hub with four flexible appendages exhibit the computational efficiency of the solution techniques. Author (GRA)

N84-24705# Aerospace Corp., El Segundo, Calif. Space Systems Div.
SUMMARY OF ENVIRONMENTALLY INDUCED ELECTRICAL DISCHARGES ON THE P78-2 (SCATHA) SATELLITE
H. C. Koons 30 Sep. 1983 36 p
(Contract F04701-82-C-0083)
(AD-A140077; TR-0083(3505-30)-1; SD-TR-83-100) Avail: NTIS HC A03/MF A01 CSCL 22/2

The mission of the P78-2 (SCATHA) satellite, launched in January 1979, is to measure parameters related to the spacecraft charging process near synchronous orbit. The Pulse Analyzer experiment onboard measures the shape of pulses on four sensors; 447 days of data have been analyzed. Thirty-four pulses on twenty different days have been related to electrical discharges with dominant frequencies between 5 and 32 MHz and peak amplitudes from 0.08 to 30.1 volts into a 50 ohm load. The amplitude of four of the pulses exceeded by a factor of five those measured during systems factory tests. This indicates that the present test specification is inadequate to simulate the EMI levels experienced by a payload from worst-case on-orbit discharges. Author (GRA)

N84-24604*# National Aeronautics and Space Administration, Washington, D. C.
SPACECRAFT CONTROL RESEARCH AT NASA
John B. Dahlgren and Lawrence W. Taylor, Jr. (NASA. Langley Research Center) *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 14 p refs (For primary document see N84-24603 15-12)
Avail: NTIS HC A15/MF A01 CSCL 22B

N84-24606# Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg (West Germany). Engineering Dept. for Gyroscopic and Space Products.
A DOUBLE GIMBALLED MOMENTUM WHEEL FOR PRECISION 3-AXIS ATTITUDE CONTROL
Werner Auer *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 8 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24611# MATRA Espace, Paris-Velizy (France). Space Branch.
MULTIFUNCTION SPACECRAFT ATTITUDE ESTIMATION AND NAVIGATION SYSTEM
J. C. Amieux and B. Caludinon *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 17 p (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24612# British Aerospace Dynamics Group, Bristol (England). Space and Communications Div.
A FILTERED ATTITUDE DETERMINATION SYSTEM FOR SPACECRAFT MEASUREMENT AND CONTROL
Maxwell Noton *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 21 p refs Sponsored in part by RAE, Farnborough, Engl. (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24613# National Aerospace Lab., Emmeloord (Netherlands).
INERTIAL-OPTICAL ATTITUDE DETERMINATION AND MODEL FOLLOWING CONTROL OF MANEUVERING SPACECRAFT
T. Zwartbol and A. P. Terpstra *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 16 p refs Sponsored in part by Netherlands Agency for Aerospace Programs NIVR (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24615# Aeritalia S.p.A., Torino (Italy). Space Systems Div.
THE INFLUENCE OF SENSOR AND THRUSTER IMPERFEC-

TIONS ON THE ATTITUDE AND POSITION OF A SPACECRAFT PERFORMING A RENDEZVOUS
R. Ancillotti and C. Cassi *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 13 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24619# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
CHARACTERIZATION OF UNCERTAINTY FOR LARGE SPACE STRUCTURE CONTROL PROBLEMS
John C. Doyle and Joseph E. Wall *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 19 p refs Sponsored in part by Honeywell Internal Research and Development Funding (For primary document see N84-24603 15-12)
(Contract F49620-82-C-0090)
Copyright. Avail: NTIS HC A15/MF A01

N84-24620# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ATTITUDE CONTROL ON LARGE FLEXIBLE SPACECRAFT
Goetz Thieme *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 15 p refs Sponsored in part by ESA (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24621# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Dynamik der Flugsysteme.
LOW AUTHORITY CONTROL OF FLEXIBLE SPACECRAFT VIA NUMERICAL OPTIMIZATION
Gerd Schulz *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 16 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24622# Rome Univ. (Italy). Dept. of Aerospace.
A DECENTRALIZED ACTIVE CONTROL SYSTEM FOR A LARGE FLEXIBLE STRUCTURE IN SPACE
Achille Daneei *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 15 p refs (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24623# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
DESIGN AND ROBUSTNESS ANALYSIS OF REDUCED ORDER CONTROLLERS FOR LARGE FLEXIBLE SPACE VEHICLES
Siva S. Banda, D. Brett Ridgely, Hsi-Han Yeh, and Douglas V. Palmer *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 25 p refs (For primary document see N84-24603 15-12)
Avail: NTIS HC A15/MF A01

N84-24625# Dassault (E. M.) Co., St. Cloud (France).
CERTIFYING ONBOARD SOFTWARE: A TOTAL PROGRESSIVE APPROACH [LA CERTIFICATION DES LOGICIELS EMBARQUES: UNE APPROCHE GLOBALE ET PROGRESSIVE]
G. Bracon *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 10 p refs In FRENCH (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24673*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
METEOROID DAMAGE TO SPACECRAFT
In its Long Duration Exposure Facility (LDEF) Feb. 1984 p 138 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N84-24706# Boston Univ., Mass.
A PROBE FOR MEASURING SPACECRAFT SURFACE POTENTIALS USING A DIRECT-GATE FIELD EFFECT TRANSISTOR Final Report, 1 Apr. 1982 - 31 Aug. 1983
M. N. Horenstein and A. Mavretic 30 Sep. 1983 170 p
(Contract F19628-82-K-0034; AF Proj. 7661)
(AD-A140024; AFGL-TR-83-0255) Avail: NTIS HC A08/MF A01 CSCL 14/2

Experimental research aimed at the development of a solid state electrostatic field and surface potential sensor has been performed. The overall goal has been to obtain a sensor that overcomes the deficiencies of existing field sensors, including the need for mechanical moving parts and relatively high power consumption. As a result, both the Floating Gate Field Effect Transistor (FGFET) and Direct Gate Field Effect Transistor (DGFET) have been developed and tested. Both devices have been successfully used to measure electrostatic fields over extened periods of time on the order of hours, and a plausible theory for device behavior has been formulated and corroborated with experimental data. Device shortcomings include substantial sensitivity to temperature changes and to extraneous sources of light (DGFET). A moderate amount of random operating point drift has also been observed. GRA

N84-24707# Texas Univ. at Dallas, Richardson. Center for Space Sciences.
AN IMPROVED ION DRIFT METER Final Report, 24 May 1982 - 23 Nov. 1983
B. J. Holt Nov. 1983 45 p
(Contract F19628-82-K-0041; AF Proj. 7601)
(AD-A140043; UTD-23071-961(E-0618); AFGL-TR-83-0320) Avail: NTIS HC A03/MF A01 CSCL 22/2

This report provides the necessary operating, diagnostic and repair information for using and maintaining the Improved Ion Drift Meter (IDM). The report is divided into four sections. Section 1 contains the instrument description and theory of operation. Section 2 contains a description of planned spacecraft-level instrument testing, stimulation requirements and procedures, and instrument handling and safety. Section 3 contains a copy of the End-Item Acceptance Test (EIAT) that describes test results and presents calibration data and procedures. Any recalibration of the instrument will be performed per the EIAT calibration test procedure. Section 4 contains a list of the schematics, drawings, parts lists and wiring lists that describe the as-built configuration of the instrument. This documentation is available to AFGL upon request. Author (GRA)

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-24708# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DILUTE PLASMA COUPLING CURRENTS TO A HIGH VOLTAGE SOLAR ARRAY IN WEAK MAGNETIC FIELDS
Norman T. Grier 1984 13 p refs Presented at the 19th Intersoc. Energy Conversion Enge. Conf., San Francisco, 19-24 Aug. 1984 (NASA-TM-83687; E-2054; NAS 1.15:83687) Avail: NTIS HC A02/MF A01 CSCL 21C

The plasma coupling current to an approximately 2000 sq cm array was measured for externally biased positive and negative

voltages on the array to 1000 V in applied magnetic field strengths from 0 to 0.93 G. The plasma density varied from 2,000 to 1.3 million electrons/cu cm. It was found that the magnetic field primarily increased the plasma coupling current for negative biases. For positive bias, the current could increase or decrease depending on the voltage, fiel strength, and plasma density. It was also found that the plasma coupling current was not very sensitive to how the plane of the array was oriented relative to the magnetic field.
Author

N84-24709# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
LOW-COST INSULATOR Final Report, Nov. 1981 - Feb. 1984
E. B. Toscano Feb. 1984 118 p
(AF Proj. 5730)
(AD-A139903; AFRPL-TR-83-059) Avail: NTIS HC A06/MF A01 CSCL 11/7

Ablative materials protect aerodynamic surfaces, propulsion structures, and ground equipment from the very high temperatures and the velocity of the gases in the exhaust. This paper describes current efforts to evaluate an ablative coating based on a low-cost polymer and a low-cost filler. The objective was to develop a low-cost, ablative/insulating material for routine application to protect costly test facilities. Experiments were conducted at the AFRPL using the standard 15-pound Ballistic Test and Evaluation System (BATES) solid propellant rocket motors containing aluminized propellants. This type of propellant produces an erosive exhaust gas which is the best condition for evaluating the ablative coating formulations. Other motors were also used for evaluation purposes, such as Peacekeeper Stages I, II, and III; Short-Length Super High Internal Pressure-Producing Orifice (HIPPO); Super BATES; and the STS-5 Space Shuttle launch. Ablative samples were tested, evaluated, and compared to commercially available ablative materials under the same conditions. It was found that the low-cost ablative/insulating materials withstood the high temperature exhaust as well as, or better than, the commercially available ablative products. Using the best candidate, the Low-Cost Insulator in the one-gallon mix, cost approximately $13.00 compared to $147.00 for the same amount of the commercially available ablative material. The AFRPL ablative material can be processed in the field for easy application and the material cures at ambient temperature.
GRA

N84-24659*# Morton Thiokol, Brigham City, Utah.
SPACE AGING OF SOLID ROCKET MATERIALS (P0005)
Leon L. Jones and R. B. Smalley, Jr. *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 94-96
(For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 21H

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N84-24710# Plymouth Polytechnic (England). Dept. of Mechanical Engineering.
THE MECHANICAL PROPERTIES OF CARBON FIBRE WITH GLASS FIBRE REINFORCED PLASTICS Abstract Only Ph.D. Thesis
John Summerscales May 1983 2 p
Avail: NTIS HC A02/MF A01

Fiber composite hybrid materials are generally plastics reinforced with two different fiber species. The combination of these three materials (carbon fibers, glass fibers and polyester resin) allows a balance between the properties of the two monofiber composites. The hybrid effect, a synergistic strengthening of reinforced plastics with two fibers when compared with the strength predicted from a weighted average from the component composites is examined mathematically. A new equation is presented which predicts the extent of the hybrid effect. Experiments with a variety of carbon/glass hybrids are undertaken to examine the validity of the theory and the effect of the degree of intermixing of the fibers. The classification and quantification of the hybrid microstructures is examined with a view to cross correlation of the intimacy of mixing and the strength. Mechanical tests are monitored with acoustic emission counting and acoustic emission amplitude distribution equipment. Fracture surfaces are examined in the scanning electron microscope. Numerical analysis by finite element methods was attempted.
M.A.C.

N84-24711*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD FOR STRENGTHENING BORON FIBERS Patent Application
James A. DiCarlo, inventor (to NASA) Filed 10 May 1984 12 p
(NASA-Case-LEW-13826-2; US-Patent-Appl-SN-608742) Avail: NTIS HC A02/MF A01 CSCL 11D

Commercially available boron filters, produced by the chemical vapor deposition of boron onto tungsten wire substrates, are strengthened by treating them in an oxygen plus inert gas (argon) containing atmosphere for a few minutes at about 880 C. High temperature oxidation increases the residual compression on the tungsten core because the fiber contracts axially during formation of a thin boron oxide coating on the fiber surface. This increases the intrinsic strength of the fiber by raising the tensile strength level required for core initiated fracture. After cooling to room temperature, the fibers are chemically polished to reduce their diameters by 0.2 mils to 0.5 mils. The chemical polish removes both original and oxidation induced surface flaws. The strengthened fibers are intended to be utilized as reinforcement in composite materials. Such materials may be boron/aluminum or boron/epoxy.
NASA

N84-24712*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPACT RESISTANCE OF FIBER COMPOSITES: ENERGY ABSORBING MECHANISMS AND ENVIRONMENTAL EFFECTS
C. C. Chamis and J. H. Sinclair 1983 25 p refs Presented at the 2nd US/Japan Conf. on Composite Mater.: Mech. Properties, Processing Sci. and Technol. and Appl., Hampton, Va., 6-8 Jun. 1983
(NASA-TM-83594; E-1996; NAS 1.15:83594) Avail: NTIS HC A02/MF A01 CSCL 11D

Energy absorbing mechanisms were identified by several approaches. The energy absorbing mechanisms considered are those in unidirectional composite beams subjected to impact. The approaches used include: mechanic models, statistical models, transient finite element analysis, and simple beam theory. Predicted results are correlated with experimental data from Charpy impact tests. The environmental effects on impact resistance are evaluated. Working definitions for energy absorbing and energy releasing mechanisms are proposed and a dynamic fracture progression is outlined. Possible generalizations to angle-plied laminates are described.
E.A.K.

N84-24713# Aeronautical Research Inst. of Sweden, Stockholm.
DELAMINATION GROWTH IN NOTCHED GRAPHITE/EPOXY LAMINATES UNDER COMPRESSION FATIGUE LOADING
T. Mohlin, A. F. Blom, L. A. Carlsson, and A. Gustavsson Dec. 1983 54 p refs Presented at ASTM Symp. on Delamination and Debonding of Mater., Pittsburgh, 8-10 Nov. 1983 Sponsored by Swedish Defence Material Administration
(FFA-TN-1983-57) Avail: NTIS HC A04/MF A01

The propagation of delamination in notched (hole) graphite/epoxy composite laminates subjected to compression fatigue loading is discussed. In the experimental phase, coupon specimens were fatigue loaded in pure compression. The tests were performed at different constant load amplitudes in ambient and humid environments at room temperature. To monitor delamination growth, the specimens were removed from the testing machine after certain numbers of load cycles and were nondestructively inspected via X-ray technique. In this way a measure of the delamination shape and area as a function of applied load level and number of cycles was obtained. Fatigue damage in terms of modulus degradation was also monitored. In the case of specimens which suffered severe damage, the residual compression strength was measured. A three dimensional finite element analysis was used in conjunction with the experimental results to characterize the delamination crack grouwth in dry specimens. Results of this analysis enabled a power law relationship between the strain energy release rate and the crack growth rate to be established. R.J.F.

N84-24714# Oklahoma Univ., Norman. School of Aerospace Mechanical and Nuclear Engineering.
NONLINEAR ANALYSIS OF LAMINATED, BIMODULAR COMPOSITE MATERIAL STRUCTURES Final Report, Sep. 1978 - Sep. 1983
C. W. Bert and J. N. Reddy Nov. 1983 39 p
(Contract N00014-78-C-0647)
(AD-A139942; OU-AMNE-83-6; VPI-E-8347) Avail: NTIS HC A03/MF A01 CSCL 11/4

Geometrically nonlinear analyses of BCM structures; experimental investigations of BCMs and structures; analyses of structures made of nonlinear composite materials, and new structural analyses. The research program was reported in a series of thirty-seven technical reports (including the present one) and sixty-eight conference papers and journal articles, all of which are listed herein. Author (GRA)

N84-24715# Naval Postgraduate School, Monterey, Calif.
ANALYSIS OF SYMMETRIC REINFORCEMENT OF QUASI-ISOTROPIC GRAPHITE-EPOXY PLATES WITH A CIRCULAR CUTOUT UNDER UNIAXIAL TENSILE LOADING M.S. Thesis
D. H. Pickett and P. Sullivan Dec. 1983 112 p
(AD-A139998) Avail: NTIS HC A06/MF A01 CSCL 11/4

An experimental and computational analysis was made of the strain field around a reinforced circular hole in four HMF330/34 graphite/epoxy (G/Ep) panels under uniaxial tensile loading. The basic panel was a 10.0 in. wide, 26.0 in. long, eight ply, quasi-isotropic (0/+45/90)s cloth laminate. Each panel was reinforced during manufacture by concurring two circular plies of the same material to each side of the panel. A circular one inch hole was drilled concentrically through the laminate to provide a stress concentration. The symmetric reinforcement reported here provided an improvement of 29 to 40% in ultimate strength over a similar but unreinforced panel under the same loading conditions. Test results indicated that panel failure would occur when the fibers in the dominating orientation were strained approximately 1%. There appeared to be a significant load transfer within the laminate at high strains from the failed fibers. A finite element analysis was made and found in excellent agreement with experimental results. GRA

N84-25599*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMPOSITE MATERIALS IN AUTOMOBILE WEIGHT REDUCTION
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 24-25 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 11D

N84-24637*# Michigan Univ., Ann Arbor.
INFLUENCE OF EXTENDED EXPOSURE IN SPACE ON MECHANICAL PROPERTIES OF HIGH-TOUGHNESS GRAPHITE-EPOXY COMPOSITE MATERIAL (A0019)
David K. Felbeck *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 19-20 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

N84-24639*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE EXPOSURE OF COMPOSITE MATERIALS FOR LARGE SPACE STRUCTURES (A0134)
Wayne S. Slemp *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 24-26 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

N84-24640*# MATRA Service Aerodynamique, Le Chesnay (France). Space Div.
EFFECT OF SPACE EXPOSURE OF SOME EPOXY MATRIX COMPOSITES ON THEIR THERMAL EXPANSION AND MECHANICAL PROPERTIES (A0138-8)
Robert Elberg *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 27-31 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

N84-24641*# Aerospatiale Etablissement des Mureaux (France).
THE EFFECT OF THE SPACE ENVIRONMENT ON COMPOSITE MATERIALS (A0138-9)
Michel Parcelier *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 32-34 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

N84-24643*# Rockwell International Corp., Tulsa, Okla.
EVALUATION OF LONG-DURATION EXPOSURE TO THE NATURAL SPACE ENVIRONMENT ON GRAPHITE-POLYIMIDE AND GRAPHITE-EPOXY MECHANICAL PROPERTIES (A0175)
J. Howard Powell and Douglas W. Welch *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 38-40 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

N84-24644*# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
THE EFFECT OF SPACE ENVIRONMENT EXPOSURE ON THE PROPERTIES OF POLYMER MATRIX COMPOSITE MATERIALS (A0180)
R. C. Tennyson and J. S. Hansen *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 41-43 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

N84-24645*# Aerospace Corp., El Segundo, Calif.
SPACE ENVIRONMENT EFFECTS ON SPACECRAFT MATERIALS (M0003)
Paul Schall *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 44-48 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11D

N84-24847# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
FATIGUE DAMAGE AND CRACK GROWTH IN RANDOM SHORT-FIBER REINFORCED COMPOSITES Abstract Only
S. S. Wang *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 34 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24848# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
A PROBABILISTIC THEORY FOR THE STRENGTH OF DISCONTINUOUS FIBRE COMPOSITES Abstract Only
Fuminori Hikami and Tsu-Wei Chou *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 35-36 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24849# Texas Univ., Arlington. Dept. of Mechanical Engineering.
PLASTICITY OF LAMINATED COMPOSITES Abstract Only
S. Nomura *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 37-38 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24850# Tel-Aviv Univ. (Israel). Dept. of Solid Mechanics, Materials and Structures.
THE EFFECTIVE BEHAVIOR OF INELASTIC COMPOSITES Abstract Only
Jacob Aboudi *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 39 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24852# Rutgers Univ., New Brunswick, N. J. Dept. of Mechanics and Materials Science.
EFFECTIVE ELASTIC MODULI OF AN ISOTROPIC, TWO-PHASE COMPOSITE Abstract Only
C. R. Chiang and G. J. Weng *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 42 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24861# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
RESONANT SCATTERING OF WAVES IN RANDOM PARTICULATE COMPOSITES Abstract Only
Vikram Kinra *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 55 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24865# Delaware Univ., Newark. Center for Composite Materials.
OBSERVATIONS ON THE FRACTURE OF FIBEROUS COMPOSITES Abstract Only
Bruce A. Yost and R. Byron Pipes *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 60 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24867# Hercules Powder Co., Wilmington, Del.
ON THE ANALYSIS OF THICK WALLED COMPOSITE MATERIAL CYLINDRICAL SHELLS Abstract Only
T. L. Walts and J. R. Vinson (Delaware Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 62 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24868# Florida Univ., Gainesville. Dept. of Engineering Sciences.
CRACK-GROWTH RESISTANCE OF LAMINATED HYBRID COMPOSITES Abstract Only
S. K. Chaturvedi and C. T. Sun *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 63 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

N84-24901# Oxford Univ. (England). Dept. of Engineering Science.
TENSILE IMPACT TESTING OF FIBRE-REINFORCED COMPOSITES Abstract Only
J. Harding *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 178-179 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-24716*# Roberts Associates, Inc., Vienna, Va.
ANALYSIS OF ELECTROPHORESIS PERFORMANCE Final Report
Glyn O. Roberts 6 Apr. 1984 60 p
(Contract NAS8-35912)
(NASA-CR-171034; NAS 1.26:171034; RA1-84-F-3) Avail: NTIS HC A04/MF A01 CSCL 07D

The SAMPLE computer code models electrophoresis separation in a wide range of conditions. Results are included for steady three dimensional continuous flow electrophoresis (CFE), time dependent gel and acetate film experiments in one or two dimensions and isoelectric focusing in one dimension. The code evolves N two dimensional radical concentration distributions in time, or distance down a CFE chamber. For each time or distance increment, there are six stages, successively obtaining the pH distribution, the corresponding degrees of ionization for each radical, the conductivity, the electric field and current distribution, and the flux components in each direction for each separate radical. The final stage is to update the radical concentrations. The model formulation for ion motion in an electric field ignores activity effects, and is valid only for low concentrations; for larger concentrations the conductivity is, therefore, also invalid. A.R.H.

N84-24717# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PRINCIPLES OF COMBUSTION [ELEMENTOS DE COMBUSTAO]
Katsumi Hiramatsu May 1983 73 p refs In PORTUGUESE; ENGLISH summary
(INPE-2759-MD/023) Avail: NTIS HC A04/MF A01

After descriptions of flames and their chemical/fluid mechanical processes, some examples of actual flames are presented. Basic measuring techniques of combustion parameters are also described. R.J.F.

N84-24718# Essen Univ. (West Germany). Inst. fuer Umweltverfahrenstechnik.
INVESTIGATIONS OF THE FEASIBILITY OF FABRIC FILTERS AT HIGH TEMPERATURES AND PRESSURES FOR AN ENERGY SAVING METHOD OF GAS PURIFICATION Final Report, Dec. 1982
Ekkehard Weber and Reinhard Schulz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 57 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-292; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 12

With current technology filtering separators, it is possible to carry out a gas cleaning only at maximum temperatures up to 550 C. Energy technologies, such as pressurized coal gasification, require hot gas cleaning at temperatures between 700 C and 1000 C and more. The development and laboratory testing of a filtering separator to be applicated in this range of temperatures is described. Twenty-six different filtermedia were developed and studied in a laboratory test facility. According to these investigations, a filtermedia appear to be qualified for the high temperature filtration. A.R.H.

N84-24719# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
THE TWO-SLAB BURNING PROBLEM
R. R. Panyam and E. W. Price Mar. 1984 50 p
(Contract N00014-79-C-0764)
(AD-A139818) Avail: NTIS HC A03/MF A01 CSCL 21/2

Details of the propellant combustion zone microstructure were studied using the simpler configuration resulting from burning down the interface between contacting oxidizer and fuel slabs. Steady burning profiles and burning rates were determined experimentally for an ammonium perchlorate oxidizer and PMMA fuel. An iterative procedure was used to determine the heat source distribution in the gas phase that would produce the experimentally observed profiles and burning rates. The procedure involved solution of energy equations in the gas and solid, and the Navier-Stokes equations in the gas, and requiring that the experimentally-based boundary conditions in the solid and gas at the surface be suitably matched. The results indicate the approximate dimensions and location of the flame zone, and details of the thermal field.
Author (GRA)

N84-24720# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
AEROSOL GROWTH IN A COLD ENVIRONMENT
Y. C. Yen Feb. 1984 30 p
(DA Proj. 4A1-61102-A-91-D)
(AD-A139907; CRREL-84-6) Avail: NTIS HC A03/MF A01 CSCL 07/4

An expression relating aerosol growth to cold environmental conditions was developed. This was accomplished by solving the diffusion equation with the method of Laplace transformation. The series solution was expressed in terms of the dimensionless parameters K (ratio of vapor density over droplet surface to droplet density), tau (ratio of environmental vapor density at time zero to vapor density over droplet surface), and dimensionless time omega (ratio of product of diffusion coefficient D and time t to square of initial radius of condensation nucleus). To take into account the variation of the vapor density over the surface of an acidic condensation nucleus due to the continuous dilution of the droplet, the solution was obtained by assuming various levels of constant vapor concentration. The final expression (R/R sub o - 1 = 2.4917 x 10 to the minus 18th power) exp(0.0737 theta) (P sub RHS/25) x (100-P sub RHS) tau to the 0.9890 powder) can be used to compute the value of R once the values of initial radius R sub o, relative humidity P sub RH, percent of relative humidity at the droplet surface P sub RHS, and environmental temperature theta are given.
Author (GRA)

N84-24721# Tennessee Univ., Knoxville. Dept. of Chemistry.
LOW TEMPERATURE FLUORINATION OF AEROSOL SUSPENSIONS OF HYDROCARBONS UTILIZING ELEMENTAL FLUORINE Final Report, 1 Sep. 1977 - 30 Mar. 1984
J. L. Adcock, E. B. Renk, K. Horita, L. H. Grossman, and M. L. Robin 30 Mar. 1984 79 p
(Contract N00014-77-C-0685)
(AD-A139958) Avail: NTIS HC A05/MF A01 CSCL 07/4

This document concludes the Office of Naval Research sponsored development of the Aerosol Fluorination Process and attendant chemistry. The introduction outlines and highlights the findings and conclusions of the twelve preceding technical reports spanning the period beginning September 1, 1977 and ending March 30, 1984. Included are the aerosol fluorinations of pivalyl, butyryl, isobutyryl and chloroacetyl acid chlorides producing analogous perfluorinated acid fluorides, in good to excellent yields. The aerosol fluorinations of polychloroalkanes produce perfluorinated polychloroalkanes in good to excellent yields however intramolecular 1,2-chloride shifts occur predictably and consistent with the known properties of alphahalo radicals. Chlorine loss and fragmentation are minimal. The aerosol fluorinations of chloroalkyl ethers including 2,3-dichloro-1,4-dioxane were successfully demonstrated, however alpha chloroalkyl ethers tend to lose chlorine more readily than beta chloroalkyl ethers. The attempted aerosol fluorinated of esters, alcohols, nitro-alkanes are described as well as the modestly successful fluorinations of methyl ketones which tend to form poor aerosols.
GRA

N84-24722# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
MECHANISMS OF PHOTOCHEMICAL REACTIONS OF TRANSITION METAL COMPLEXES: EXCITED STATE ELECTRON TRANSFER AND ORGANOMETALLIC PHOTOCHEMISTRY Interim Technical Report
M. S. Wrighton 20 Mar. 1984 13 p
(Contract N00014-75-C-0880)
(AD-A140006; TR-42-ONR) Avail: NTIS HC A02/MF A01 CSCL 07/5

This article summarizes two major areas of research, electron transfer and organometallic photochemistry, addressed during the last dozen or so years. The article emphasizes aspects of the mechanisms of photochemical reactions of transition metal complexes in these two areas. Excited state electron transfer and photoreactions of organometallic complexes have been, and will be, major areas of research opportunity. Practical applications may come in the fields of energy conversion and catalysis.
Author (GRA)

N84-24723# Southampton Univ. (England).
ELECTROCHEMISTRY AT THE MOLECULAR LEVEL Periodic Progress Report, 1 Dec. 1982 - 31 Oct. 1983
P. J. Hendra, M. Fleishmann, A. Bewick, and J. Robinson Dec. 1983 19 p
(Contract N00014-77-G-0006)
(AD-A140070; Rept-9; PR-9) Avail: NTIS HC A02/MF A01 CSCL 07/4

This report covers work completed at Southhampton only during the period January to October 1983. The work covered is included under three distinct, and to some extent unrelated research effort areas; vis: (a) An exploration of the use of in situ techniques in completing molecular analyses of working electrode-electrolyte systems. This field embraces: X-ray measurements; Raman studies; and Infrared methods; (b) A long term investigation of the properties of microelectrode systems; and (c) A study of the role of molecular entanglements in dictating the properties of polymer solids. In each area considerable progress has been made and we therefore offer as a report a set of abstracts of papers either already published or to appear in the very near future. GRA

N84-24724# Brigham Young Univ., Provo, Utah. Dept. of Chemistry.
SUPERCRITICAL FLUID CHROMATOGRAPHY/SUPERSONIC JET SPECTROSCOPY Progress Report, 1 Nov. 1983 - 31 Jan. 1984
Milton L. Lee and Steven R. Goates 1984 13 p ref
(Grant DE-FG22-83PC-60807)
(DE84-007364; DOE/PC-60807/2) Avail: NTIS HC A02/MF A01

Modifications were made in the designs for the supercritical fluid extraction/fractionation unit and the vacuum chamber for supersonic jet spectroscopy. The construction of the extraction/fractionation unit is nearly complete and the construction of the vaccum system is presently underway. An interface has been constructed for supercritical fluid chromatography - mass spectrometry based on precise temperature control. Initial experiments indicate effective transfer of the chromatographic effluent, and preservation of chromatographic efficiency.
DOE

N84-24725# Illinois Inst. of Tech., Chicago. Dept. of Chemical Engineering.
ELECTROCHEMISTRY OF CARBIDES AND CARBON CATHODES IN MOLTEN HALIDES Final Report
J. R. Selman Jun. 1983 15 p refs
(Contract DE-AC02-77ER-04445)
(DE84-007966; DOE/ER-04445/T4) Avail: NTIS HC A02/MF A01

During the six-year period 1977 to 1983 the electrochemistry of lithium and calcium carbides and of carbon cathodes was investigated with emphasis on: the characteristics of carbon

electrode potentials in carbide-containing melts and the behavior of carbon as an intercalating cathode in lithium-based melts. A direct connection between the carbon/carbide electrochemistry and the intercalation kinetics of graphite was demonstrated in the case of lithium, with likely extension to calcium. Five intercalation stages of lithium were identified by coulometry and their lithium activity measured for the first time, by the electromagnetic frequency method. The diffusivity of lithium in graphite was also determined for the first time, as a function of the intercalation stage. DOE

N84-24726# Sandia Labs., Albuquerque, N. Mex.
EXAMINATION OF FRONTAL DEVELOPMENT DURING A DRY FORWARD COMBUSTION
David O. Lee, J. Robert Wayland, Jr., and Paul C. Montoya Mar. 1984 33 p refs
(Contract DE-AC04-76DP-00789)
(DE84-008304; SAND-83-0756) Avail: NTIS HC A03/MF A01

The thermocouple data from the various locations of the combustion tube for a dry forward burn were examined. Based on these data the behavior of the burn front was reconstructed and interpreted to obtain such frontal parameters as burn front velocity, its thickness, the component zone velocities, and the thicknesses of the component zones of the front as a function of time and distance in the tube. These component zones of the front are then indicated by the capacitance and resistivity measurements obtained by instrumentation developed for this purpose. Thermogravimetric analysis was also used to further quantify the specific events. DOE

N84-24727# Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
CO + H/SUB 2 REACTION OVER NITROGEN-MODIFIED IRON CATALYSTS Quarterly Technical Progress Report, 1 Oct. - 30 Dec. 1983
W. Nicholas Delgass Feb. 1984 31 p refs
(Grant DE-FG22-82PC-50804)
(DE84-009046; DOE/PC-50804/5) Avail: NTIS HC A03/MF A01

The feasibility of utilizing synthesis gas (CO + H2) via the Fischer-Tropsch reaction pathway for the production of fuels and chemicals is well established. The present procedure, however, requires extensive processing if the production of non-essential by-products is to be avoided. Improved catalysts for the Fischer-Tropsch process would therefore be advantageous. Nitrogen is known to affect the performance of the iron catalysts currently employed; the result is lower molecular weight by-products and enhanced alcohol yield. The role of surface nitrogen in altering the product distribution and in stabilizing the catalyst activity of the synthesis reactions are investigated. 'In situ' Mossbauer spectroscopy was employed to identify various iron nitride phases and examine their stability during reaction. Ultrahigh vacuum techniques supplemented the Mossbauer characterizations. The kinetic and catalytic effects of ammonia addition to the synthesis gas stream were also examined. R.S.F.

N84-24728# Pacific Northwest Lab., Richland, Wash. Chemical Mehtods and Kinetics Section.
SUPERCRITICAL FLUID METHODS IN ANALYTICAL CHEMISTRY
R. D. Smith, B. W. Wright, and H. R. Udseth Oct. 1983 7 p refs Presented at the 26th ORNL-DOE Conf. on Anal. Chem. in Energy Technol.. Knoxville, Tenn., 11-13 Oct. 1983
(Contract DE-AC06-76RL-01830)
(DE84-008289; PNL-SA-11787; CONF-831025-31) Avail: NTIS HC A02/MF A01

Increasing the pressure of a supercritical fluid allows its properties to be varied continuously from those of a gas to those of a dense fluid with the solvating power of a liquid. The potential for improved chromatographic methods was recently realized using capillary columns suited for supercritical fluid chromatography. Supercritical fluids also offer distinct advantages for transport of thermally labile compounds to the mass spectrometer ion source. DOE

N84-24729# Wisconsin Univ., Madison.
MECHANISTIC STUDIES RELATED TO THE CATALYZED REDUCTION OF CARBON MONOXIDE TO HYDROCARBONS Final Report, 1 Apr. 1977 - 30 Jun. 1984
Charles P. Casey Feb. 1984 21 p refs
(Contract DE-AC02-77ER-04222)
(DE84-007963; DOE/ER-04222/5) Avail: NTIS HC A02/MF A01

Compounds related to proposed intermediates in the hydrogenation of carbon monoxide over homogeneous and heterogeneous catalysts were studied. The synthesis, and reactions of metal formyl compounds were investigated. The synthesis and disproportionation reactions of hydroxymethyl metal compounds were explored. Reactions involving interconversion of nu(5)- and nu'-C5H5 organometallic compounds were discovered. Synthetic routes to bimetallic compounds with bridging hydrocarbon ligands were developed. The first bimetallic compound with a budging CH ligand was prepared. The hydrocarbon reaction in which the CH bond of a bridging methylidyne complex adds across a carbon-carbon double bond was discovered. Heterobimetallic compounds linked by a heterodifunctional ligand and heterobimetallic compounds with directly bonded early and late transition metals were synthesized in a search for new CO hydrogenation catalysts. DOE

N84-24730# Industrial Environmental Research Lab., Research Triangle Park, N. C.
INDICATORS OF HAZARD FOR POLYCYCLIC ORGANIC MATTER
J. O. Milliken, M. R. Leadbetter, and R. J. Carroll 1984 21 p refs Presented at 7th Intern. Symp. on Polynuclear Aromatic Hydrocarbons, Columbus, Ohio Submitted for publication Prepared in cooperation with North Carolina Univ.
(PB84-167493; EPA-600/D-068) Avail: NTIS HC A02/MF A01 CSCL 07D

The paper addresses the problem of relating measurements of polycyclic organic matter (POM) in source emissions to the potential hazard associated with the total POM in the sample measured. Although uncertainties exist in these quantitative measurements of POM, a more serious problem concerns the lation of hazard to a given mass and composition of POM. As used here, hazard is defined as the quantity that may be used to indicate the relative environmental problems of various source emissions. For each individual type of POM source, both benzo(a)-pyrene-B(a)P-type of POM provide excellent indicators of hazard, evaluated by a weighted sum of concentrations. The method of using a linear combination of masses of the individual POM compounds to model hazaard due to POM is shown to be appropriate under certain conditions, and to follow directly from a simple probabilistic model of the physical and chemical events leading up to a response event. Author (GRA)

N84-24731# Eltron Research, Inc., Naperville, Ill.
SOLAR-ASSISTED HYDROGEN GENERATION BY PHOTOELECTROCATALYSIS: ELECTRIC BIREFRINGENCE AND ELLIPSOMETRIC SPECTROSCOPY OF THE SEMICONDUCTOR/ELECTROLYTE INTERFACE Annual Report, 3 Sep. 1982 - 31 Aug. 1983
P. G. P. Ang, M. R. St.John, and A. F. Sammells Sep. 1983 117 p refs Sponsored by Gas Research Inst.
(PB84-169804; GRI-83-0023) Avail: NTIS HC A06/MF A01 CSCL 07D

The direct conversion of solar energy to chemical energy using liquid-junction semiconductor devices is potentially of great importance in the maintenance of long-term energy supplies. In particular, the generation of hydrogen from water using such devices has many attractions because of its inherent simplicity. Electro-optical techniques, principally electric birefringence and ellipsometric spectroscopy, for 'in situ' measurement of the interfacial region between the semiconductor and the electrolyte solution are discussed. This information will be used in conjunction with other spectroscopic and photoelectro-chemical techniques to delineate those features, necessary at this interface, for the achievement of high photo-electrolysis efficiencies. The thorough understanding obtained for both the photoelectrode and its liquid

junction with aqueous electrolytes will be directed toward the development of high-efficiency photo-electrochemical cells for hydrogen generation. Author (GRA)

N84-24732# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
COMBUSTION PROBLEMS IN TURBINE ENGINES
Loughton, England Jan. 1984 434 p refs In ENGLISH and FRENCH Symp. held in Cesme, Turkey, 3-6 Oct. 1983
(AGARD-CP-353; ISBN-92-835-0346-5) Avail: NTIS HC A19/MF A01

With ever increasing emphasis on improving gas turbine cycle efficiency, reducing engine development time/cost, reducing cost of ownership, minimizing pollutant emissions, and more recently the need to develop fuel tolerant combustion systems, the combustion problems in gas turbine engines require special considerations. Alternative fuels, fuel preparation, kinetics, soot, liner cooling, and combustion modeling are among the topics discussed. R.J.F.

N84-24733# National Research Council of Canada, Ottawa (Ontario). Fuels and Lubricants Lab.
AVIATION FUEL SPECIFICATION REQUIREMENTS: THEIR SIGNIFICANCE AND FUTURE TRENDS c28
L. Gardner and R. B. Whyte *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 15p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

During at least the next twenty years the only economically available fuels for aviation turbine engines will be hydrocarbons, but the composition will change due to increased demand relative to other petroleum products, changes in available crudes, changes in refinery processing and the introduction of synthetic crudes from heavy oils, tar sands, shale and coal. An attempt is made to predict some of the changes in fuel properties which are likely to occur and the problems these will cause in current turbine engines. Increasing shortages of suitable crude feedstocks and the threat of disruptions in supply due to world economic and potential international conflicts may require a broadening of current jet fuel specifications to improve availability and to allow, at minimum cost and maximum energy efficiency, the use of feedstocks from alternative sources including heavy petroleum crudes, tar sands, oil shale and coal. To prepare for an uncertain future in jet fuel quality and availability, research is needed to more fully understand the effects of varying fuel properties on engine and aircraft fuel system performance, reliability and durability and to build the technology base that would allow greater fuel flexibility in future aircraft. Since current production engines will still be in service at the turn of the century, research and advanced technology to accommodate possible future fuels must include cost effective retrofit options for current production aircraft as well as new engine and aircraft fuel systems. R.J.F.

N84-24734*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESEARCH ON AVIATION FUEL INSTABILITY c28
Charles E. Baker, David A. Bittker, Stephen M. Cohen, and Gary T. Seng *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 11p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01 CSCL 21B

Current aircraft turbine fuels do not present a significant problem with fuel thermal stability. However, turbine fuels with broadened properties or nonpetroleum derived fuels may have reduced thermal stability because of their higher content of olefins, heteroatoms, and trace metals. Moreover, advanced turbine engines will increase the thermal stress on fuels because of their higher pressure ratios and combustion temperature. In recognition of the importance of this problem, NASA Lewis is currently engaged in a broadly based research effort to better understand the underlying causes of fuel thermal degradation. The progress and status of our various activities in this area are discussed. Topics covered include: nature of fuel instability and its temperature dependence, methods of measuring the instability, chemical mechanisms involved in deposit formation, and instrumental methods for characterizing fuel deposits. Finally, some preliminary thoughts on design approaches for minimizing the effects of lowered thermal stability are briefly discussed. R.J.F.

N84-24735# United Technologies Corp., East Hartford, Conn.
ALTERNATIVE FUEL DEPOSIT FORMATION c28
J. TeVelde, L. J. Spadaccini, E. J. Szetela, and M. R. Glickstein (Pratt and Whitney Aircraft) *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)
(Contract M00140-80-C-0097)
Avail: NTIS HC A19/MF A01

A heated tube apparatus was used to evaluate the deposit formation rates of four liquid hydrocarbon fuels and to determine the effect fuel deposits have on the transfer characteristics of aircraft gas turbine fuel systems. The fuels tested were: a low aromatic JP-5, a blend of 80 percent JP-5 and 20 percent hydrocracked gas oil, a blend of 50 percent JP-5 and 50 percent No. 2 heating oil, and a shale derived JP-5. Deposit formation rates ranging from 10 micrograms per square centimeter per hour to 3000 micrograms per square centimeter per hour were obtained at tube wall temperatures ranging from 480 K to 800 K, with peak formation rates occurring at initial surface temperatures of 644 K to 672 K. Results indicate that deposit formation rate correlates very well with initial surface temperature and the thermal stability rankings derived from present experimental results agree very well with rankings based upon independent analysis. The deposit thermal resistance, as calculated from heat transfer measurements, correlates well with measured deposit quantity and thickness. Heat transfer analyses indicate that the deposit thermal conductivity increases with increasing deposit thickness, and ranges from values approximating the thermal conductivity of the fuel to values approaching that of amorphous carbon. R.J.F.

N84-24736# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
COMBUSTOR TECHNOLOGY FOR BROADENED-PROPERTIES FUELS c28
W. J. Dodds *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

In order to increase the availability and reduce the cost of future fuels for aircraft gas turbine engines, it may be necessary to broaden fuel specifications. Anticipated changes in fuel properties, and the effects of these changes on combustion system performance, operating characteristics, durability, and emissions are briefly reviewed, and results to date of a program being conducted to develop and demonstrate combustor technology required to utilize broadened properties fuels in current and next generation engines are described. Combustion system design considerations and tradeoffs for burning broadened properties fuels are discussed, and test experience with several applicable combustor design modifications to the General Electric CF6-80A combustion system is reviewed. Modifications were demonstrated to improve liner cooling and reduce smoke in the conventional annular combustor, thereby reducing effects of variations in fuel hydrogen content. Advanced staged and variable geometry combustor concepts for burning broadened properties fuels were also demonstrated. R.J.F.

N84-24737# Pratt and Whitney Aircraft, West Palm Beach, Fla. Engineering Div.
FUEL EFFECTS ON GAS TURBINE COMBUSTION SYSTEMS
Stanley A. Mosier *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 15p refs Sponsored in part by the U.S. Army and U.S. Navy (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The effects of variations in properties and characteristics of liquid hydrocarbon base fuels in gas turbine engine combustors was investigated. Baseline fuels consisted of military specification materials processed from petroleum and shale oil. Experimental fuels were comprised of liquid petroleum blends that were prepared

specifically to exhibit desired physical and chemical properties. These fuels were assessed for their influence on ignition and performance characteristics in combustors of the F100, TF30, and J57 (TF33) engines at simulated operating conditions. In general, during relatively short duration tests, combustor ignition and performance became increasingly poorer as fuel quality deviated from specification or historical values. Author

N84-24738# Pratt and Whitney Aircraft of Canada Ltd., Mississauga (Ontario). Combustion Aerodynamics Dept.
FUEL CHARACTER EFFECTS ON PERFORMANCE OF SMALL GAS TURBINE COMBUSTION SYSTEMS **c07**
P. Sampath and M. Gratton *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The effects of potential broadened specification and alternate source jet fuels on the performance of small gas turbine combustors are presented. The review is based primarily on the results of a research program to evaluate the performance of a small 'can' combustor and two reverse flow annular combustors with fifteen fuels. The fuels represented variations in several key characteristics such as hydrogen content, aromatics, viscosity, boiling range, volatility and thermal stability. Alternate source fuels included oil shale and tar sand derived fuels. Results of property changes of performance parameters of the 'can' combustor, such as life, starting and stability characteristics, exhaust emissions and smoking tendencies, are discussed. Author

N84-24739# Southwest Research Inst., San Antonio, Tex.
U.S. ARMY ALTERNATIVE GAS-TURBINE FUELS RESEARCH: MERADCOM **c28**
C. A. Moses *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

A research program on the effects of alternative fuels on gas turbine engine combustion is reviewed. Experimental programs primarily concentrated on two areas of changing fuel properties; one, the effects of volatility on combustor performance characteristics such as ignition and combustion efficiency; and, two, the effects of changing fuel chemistry on soot formation and flame radiation. R.J.F.

N84-24740# Laval Univ. (Quebec). Dept. de Genie Mecanique.
THE EFFECTS OF FUEL COMPOSITION UPON HEAT TRANSFER IN GAS TURBINE COMBUSTORS **c07**
J. Odgers and D. Kretschmer *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs Sponsored in part by National Sciences and Engineering Research Council of Canada (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The widening of fuel specifications which will lead to fuels with lower hydrogen content is discussed. This change will influence the heat transfer in combustion chambers, mainly through increased radiation from increased carbon in the flame. The influence of ring compounds is not very clear and the best correlation is with fuel hydrogen content. The luminosity factor is still considered to be the most convenient tool for the prediction of fuel effects upon heat transfer. E.A.K.

N84-24741# Avco Lycoming Div., Stratford, Conn. Advanced Combustor Design Dept.
ALTERNATIVE FUELS USE IN A VEHICULAR GAS TURBINE **c28**
Nicholas R. Marchionna *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 13p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

Practical aspects of combustor design for the use of alternate fuels in the AGT 1500 vehicular gas turbine engine are discussed. Engine performance test results are compared to laboratory data and to combustor component performance over the range of engine operating conditions. Fuel effects on starting and low power efficiency are related to atomizer peformance and to drop size distribution. Smoke emissions are correlated with fuel characteristics, engine operating conditions, and combustor primary zone design parameters. Results are presented for fuels ranging from gasoline to No. 6 oil. E.A.K.

N84-24742# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DESIGN OF A COMBUSTION CHAMBERS WITH REVERSE FLOW FOR SMALL GAS TURBINES **c07**
Andre Mestre and Guy Lagain (TURBOMECA) *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p ref (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

Reverse flow combustion chambers for small gas turbines which were atmospheric operation to allow direct observation of the flame and corresponding movie pictures are outlined. Two different types of fuel injection were compared. The mechanical pulverization and prevaporization. The prevaporization technique gives higher performance, better temperature distribution, lower emission of pollutants, and high efficiency. It is found that cold starts are easier when mechanical injection and auxiliary fuel injectors had to be used. E.A.K.

N84-24743# Rolls-Royce Ltd., Bristol (England).
RECENT RESEARCH ON THE EFFLUX OF THE ROLLS-ROYCE VAPORISER FUEL INJECTOR **c07**
H. C. Low *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The effectiveness of the vaporizer fuel injection system is demonstrated in such engines as the Olympus 593 (in Concorde), the Pegasus (in Harrier) and the RB199 (in Tornado). Its potential is illustrated by its selection for the RB211-CE3 advanced technology demonstration engine, but it is subject to increasingly severe demands and duties resulting from the imposition of emissions legislation, increasing engine pressure ratios, and reducing fuel quality. More detailed knowledge of the factors which determine how the device functions are required. A spark photographic study of a vaporizer efflux in combusting and noncombusting environments at pressures up to five atmospheres is described. At simulated engine idle conditions the two mechanisms of fuel heating within the vaporizer combine to produce a highly vaporized efflux. E.A.K.

N84-24744# Cranfield Inst. of Tech., Bedfordshire (England). School of Mechanical Engineering.
EFFECTS OF AIRBLAST ATOMIZER DESIGN UPON SPRAY QUALITY **c34**
A. K. Jasuja *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 14p refs Sponsored in part by U.K. Ministry of Defence (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The application of airblast atomization to gas turbine engines was investigated. The need to identify the effect of various design features on the spray quality to design atomizers of optimum performance with a minimum of cost and complexity is designed. The atomizer scale, configuration, the nature of fuel preparation before exposure to air, for the most commonly used prefilming and plain airblast atomizers are emphasized. The experimental mean drop size data was obtained through the use of laser light scattering techniques over a wide range of conditions. It is concluded that the plain jet airblast atomizer which features multiple, transversely injected liquid jets into a swirling airstream yield spray quality comparable to that achieved by their prefilming counterparts especially under high air pressure conditions. E.A.K.

N84-24745# Karlsruhe Univ. (West Germany). Lehrstuhl und Inst. fuer Thermische Stroemungsmaschinen.
OPTICAL MEASUREMENTS OF DROPLET SIZE DISTRIBUTIONS: SPECIAL CONSIDERATIONS IN THE PARAMETER DEFINITION FOR FUEL ATOMIZERS **c34**
S. Wittig, M. Aigner, K. Sakbani, and T. Sattelmayer *In* AGARD

Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

Fuel nozzle performance, the droplet size distribution which is frequently characterized by the Sauter mean diameter one of the dominant parameters was evaluated. The importance of flow parameters and size distribution in applying nonintrusive optical techniques is emphasized. An optical diffraction type particle sizer was used for analysis of fuel sprays from airblast and pressure atomizers. It is shown that the Sauter mean diameter alone is generally not suited for describing the nozzle performance. The influence of the flow field on the apparent droplet size distribution is outlined. E.A.K.

N84-24746# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Antriebstechnik.
LIQUID FUEL ATOMIZATION AND MIXING IN A HIGH VELOCITY AIR STREAM **c34**
H. Eickhoff, D. Granser (Kraftwerk-Union), and W. Krockow (Kraftwerk-Union) *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 8p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The reduction of emissions in combustion processes are discussed. The atomization and mixing performance of different types of injection devices for liquid fuel were examined. Air blast atomizers of the plain jet and prefilming type are investigated. Measurements of the initial droplet size distribution and final mixing in a duct are presented and discussed. E.A.K.

N84-24747*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DETAILED FUEL SPRAY ANALYSIS TECHNIQUES **c34**
Edward J. Mularz (AVRADCOM), Maria A. Bosque, and Frank M. Humenik *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs Previously announced as N83-34943 (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01 CSCL 20D

Fuel spray analyses which are a necessary input to the analytical modeling of the complex mixing and combustion processes which occur in advanced combustor systems are discussed. It is anticipated that by controlling fuel air reaction conditions, combustor temperatures can be better controlled, leading to improved combustion system durability. The capability to measure liquid droplet size, velocity, and number density throughout a fuel spray and to utilize this measurement technique in laboratory benchmark experiments was demonstrated. The experiment to characterize fuel sprays is described. The experiments and data are useful for application to and validation of turbulent flow modeling to improve the design systems of future advanced technology engines. E.A.K.

N84-24748# Instituto Superior Tecnico, Lisbon (Portugal). Dept. Engenharia Mecanica.
DROPLET SIZE DISTRIBUTION AND LIQUID VOLUME CONCENTRATION IN A WATER SPRAY: PREDICTIONS AND MEASUREMENTS **c34**
Gabriel P. Pita *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 9p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

A water spray, from a twin fluid atomizer, was studied at different air temperatures and at atmospheric pressure. The Sauter Mean Diameter, D sub 32, and the droplet volume distribution were measured at four different distances from the injector. An optical method was used to measure droplet sizes. Predictions of the Sauter Mean Diameter, liquid volume concentration and droplet size distribution were also evaluated. The influence of the air velocity, air temperature and of the water flow rate in the spray S.M.D. and in the liquid volume concentration at different distances from the injector have been measured. The predictions showed good agreement with experimental results. Author

N84-24749# Royal Aircraft Establishment, Farnborough (England).
THE DESIGN AND PERFORMANCE OF A COMBUSTOR WITH A MULTIPLE JET PRIMARY ZONE **c07**
J. R. Tilston and J. P. D. Hakluytt *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 9p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

Using large numbers of orifices in the head of the combustor to generate independent shear layers in a co-operative array, the so-called pepperpot concept was evolved to secure efficient combustion in a weak primary zone. Specific targets were high efficiency and very low smoke at both low and high power levels when burning either kerosene or diesel fuels. Performance tests of a pepperpot demonstrator combustor at representative conditions of idle, intermediate and high power using both fuels are described. An impresssive combustion performance has been realized over the whole power range, together with excellent exit traverse quality and tolerance to fuel type. Author

N84-24750# Sydney Univ. (Australia). Dept. of Mechanical Engineering.
SOOT FORMATION IN DIFFUSION FLAMES
J. H. Kent and H. G. Wagner (Goettingen Univ.) *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 11p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

Soot measurements in laminar and turbulent diffusion flames are reviewed. In laminar flames soot particles have high formation rates near the reaction zone and growth takes place in the fuel rich interior. Optical methods have revealed the regions of these separate processes with good spatial resolution. Sampling and optical techniques have been applied to turbulent flames to determine parametric influences upon soot formation and burnout rates. Recent experimental evidence indicates that formation rates can be mixing or chemically controlled. Burnout rates are additionally very influenced by temperature. Under simple conditions the smoking propensity of a flame may be determined only by the temperature near the tip. Author

N84-24751# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Physikalische Chemie.
GROWTH OF ELECTRICALLY CHARGED SOOT PARTICLES IN FLAMES
K. H. Homann, E. Stroefer, and H. Wolf *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs Sponsored in part by Deutsche Forschungsgemeinschaft and Fonds der Chemischen Industrie (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

A part of the soot particles in fuel-rich hydrocarbon flames carry an electric charge. Charges of both signs occur on soot particles in the same flame. Through a molecular beam sampling system charged soot particles and smaller ions have been drawn from low pressure flames of acetylene and benzene and analyzed in an electrostatic mass filter and a deflection system. The development of particle mass, number density and the volume fraction of charged and neutral soot is reported for these flames under different burning conditions. The volume fraction of charged soot in acetylene flames increases with temperature while there are no large charged soot particles at all in benzene flames. The role of charged species in the mechanism of soot formation and the process of charging is discussed in terms of a chemiionization mechanism. Author

N84-24752# Centre National de la Recherche Scientifique, Mulhouse (France). Centre de Recherches sur la Physico-Chimie des Surfaces Solides.
FORMATION AND DESTRUCTION OF ORGANIC POLLUTANTS IN THERMAL SYSTEMS AND FLAMES
J. Lahaye, G. Prado, and A. Garo *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 19p refs Prepared in cooperation with Haute-Alsace Univ., Mulhouse, France (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The main pollutants formed in thermal systems are soot, cenospheres, polyaromatic hydrocarbons and cyclic molecules including heteroelements such as oxygen and nitrogen. PAH are produced through reactions between aromatic and unsaturated aliphatic structures. PAH are intermediate species in soot formation. Some PAH, however, remain in flames and can be adsorbed on soot particles. In flames, hydroxyl radicals are responsible for soot post-combustion. Some practical results on soot production in turbines are reviewed. The present lecture is only concerned with soot. B.W.

N84-24753# California Univ., Irvine. Combustion Lab.
OPTICAL MEASUREMENTS OF SOOT SIZE AND NUMBER DENSITY IN A COMPLEX FLOW, SWIRL-STABILIZED COMBUSTOR **c74**
G. S. Samuelsen, C. P. Wood, and T. A. Jackson *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 15p refs (For primary document see N84-24732 15-25)
(Contract F08635-83-C-0052)
Avail: NTIS HC A19/MF A01

In-flame optical measurements of soot particulates in a turbulent, recirculating (i.e., complex flow) model laboratory combustor are described. A nonintrusive optical probe based on large angle (60 deg, 20 deg) intensity ratio scattering was used to yield a point measurement of particulate in the size range of 0.08 to 0.38 micrometers. The performance of the optical technique was evaluated, and an exploratory assessment of the spatial distribution of soot was conducted with attention to fuel molecular structure, fuel loading, and a smoke-suppressant additive (ferrocene). Isooctane and mixtures of isooctane with various ring and aromatic compounds blended to yield the smoke point of a JP-8 stock were prevaporized and introduced through a hollow cone nozzle. The addition of ring compounds to the base isooctane substantially changed the distribution of soot and increased the overall emission by 300%. The production of soot was substantially reduced by a decrease in fuel loading, and marginally reduced or not affected by the additive depending on fuel structure. The optical technique is a potentially powerful tool for providing the experimental evidence necessary to understand the processes of soot formation and burnout in complex flows typical of gas turbine combustors. However, scanning electron micrographs of extracted sample established that the technique is limited to the large particle wing of the soot size distribution, and optical and electronic processing can induce biasing and uncertainties which must be understood and controlled before the potential of the technique can be fulfilled. Author

N84-24754# Centre National de la Recherche Scientifique, Orleans (France). Centre de Recherches sur la Chimie de la Combustion et des Haute Temperatures.
EXPERIMENTAL STUDY AND MODELING OF THE KINETICS OF HYDROCARBON COMBUSTION [ETUDE EXPERIMENTALE ET MODELISATION DE LA CINETIQUE DE COMBUSTION DES HYDROCARBURES]
M. Cathonnet, F. Gaillard, J. C. Boettner, and H. James *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs In FRENCH (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The first stages of hydrocarbon combustion are characterized by a degradation of the initial hydrocarbon into hydrocarbonic fragments with a small number of carbon atoms. Modeling combustion in turbomachinery requires knowledge of the kinetics of the oxidation of these fragments. Results of studies of the oxidation of propane and ethylene in running reactors are presented for pressure between 1 and 10 bars. A mechanism is proposed to account, by simulation, for experimental results as well as those obtained by others using different techniques and covering an extensive experimental fields. Transl. by A.R.H.

N84-24755# Rolls-Royce Ltd., Derby (England). Combustion Technology Dept.
THE DESIGN AND DEVELOPMENT OF A LOW EMISSIONS TRANSPLY COMBUSTOR FOR THE CIVIL SPEY ENGINE **c07**
J. K. Bhangu, D. M. Snape, and B. R. Eardley *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 18p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

This paper describes the design and development of a low emission turbo-annular combustor now entering service in the Spey aero gas turbine engine. The combustors, ten of which form the turbo-annular combustion system, are constructed from an advanced cooling material known as Transply. Use of this pseudo transpiration cooling material enables a significant saving to be made in the utilization of the wall cooling air. This air is used in optimizing the primary zone and intermediate zone stoichiometry which, combined with the use of an aerodynamic curved vane swirler, results in a substantial reduction in the emission levels. A number of significant durability problems have been overcome to meet the rigorous demands of aero-engine operation. The paper outlines the development process, starting with the constraints imposed by an existing engine design and describing the rig and engine test program leading to a full definition of the aero-thermodynamics of the developed combustor. Author

N84-24756# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
ADVANCED COMBUSTOR LINER COOLING CONCEPTS **c07**
B. Simon, D. Schuber, and U. Basler *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs Sponsored in part by German Ministry of Defence (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

Small gas turbine liner cooling is especially difficult due to the low combustor air flow and relatively large flame tube areas. Therefore, it is desirable to increase the cooling potential of the cooling air by application of combined convective-film cooling. Its advantage must be balanced carefully against the disadvantage of increased weight and production cost. The large number of variable parameters of a combined cooling configuration requires a computer model which allows the simulation of different cooling approaches. For the verification of this, model tests with various configurations were conducted in a 2D-cooling rig. Good agreement between measured and calculated liner temperatures could be achieved. Thus, the model is suitable to show under which conditions a marked decreased of wall temperature can be reached compared with the case of straight film cooling under the same conditions. Author

N84-24757# Karlsruhe Univ. (West Germany). Lehrstuhl und Inst. fuer Thermische Stroemungsmaschinen.
DEVELOPMENT OF TEMPERATURE-, VELOCITY- AND CONCENTRATION-PROFILES IN A CURVED COMBUSTOR **c07**
S. Wittig, R. Kutz, B. E. Noll, and K. H. Platzer *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 9p refs Sponsored in part by Deutsche Forschungsgemeinschaft (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The influence of bends as found in reverse-flow combustors or in various stationary gas turbines on the flow exiting the mixing zone was studied experimentally. In a first approach, a duct with circular cross-section was chosen with a predetermined temperature-, velocity- and concentration-profile exiting the primary zone of an atmospheric burner. The velocity profiles were measured in three planes (0, 45, 90 deg) and downstream of the bend using a five-hole spherical probe. Also, the temperature and pressure distribution as well as the concentration profiles particularly of CO_2 were measured in the respective planes. It was found, that energy as well as species-transport arises primarily from secondary flow phenomena combined with strong pressure gradients. In a first attempt to clarify the various phenomena, the development of the static pressure and the temperature is calculated for two-dimensional flow using a finite difference scheme utilizing the well known k-epsilon-turbulence model. It is shown that similar pressure characteristics are obtained. Corresponding temperature profiles, however, result from different sources. M.G.

N84-24758# Leeds Univ. (England). Dept. of Mechanical Engineering.

AN INVESTIGATION OF THE INTERACTION BETWEEN MULTIPLE DILUTION JETS AND COMBUSTION PRODUCTS

P. V. Chlebour (Rolls Royce Ltd.), S. H. Nasser, F. B. Sebbowa, and C. G. W. Sheppard *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 11p refs (For primary document see N84-24732 15-25)

Avail: NTIS HC A19/MF A01

An investigation was made of the interaction between multiple dilution jets discharging from a common annulus into hot combustion products. Gas concentrations, mean and fluctuating gas temperatures (using compensated fine wire thermocouples) were measured throughout the mixing region for three dilution jet flow rates. A parallel theoretical study of the same flows was conducted using the Rolls-Royce PACE computer code (a finite difference program employing a k-e turbulence sub-model). The output from this program proved useful in visualizing the flow and interpreting the experimental data. Attention is drawn to the care needed when comparing various types of experimental information and apparently similar parameters output from computer codes on a mass flow weighted basis. M.G.

N84-24759# Centre National de la Recherche Scientifique, Poitiers (France). Lab. d'Energetique et de Detonique.

A STUDY OF THE FUNDAMENTAL PROBLEMS OF COMBUSTION IN THE COMBUSTION CHAMBERS OF TURBOJETS USING A TUBULAR REACTOR [ETUDE DE PROBLEMES FONDAMENTAUX DE LA COMBUSTION DANS LES FOYERS DE TURBOREACTEURS AU MOYEN D'UN REACTEUR TUBULAIRE]

J. C. Bellet, P. Cambray, M. Champion, and D. Karmed *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 13p refs In FRENCH (For primary document see N84-24732 15-25)

Avail: NTIS HC A19/MF A01

At the entrance of a tubular reactor, cool gases (hydrocarbon-air) and heated gases are rapidly mixed in such a way that combustion is stabilized by recirculating the heated gases. This tubular reactor is used to validate, under representative combustion chamber conditions, the kinetics of hydrocarbon combustion proposed by other authors, as well as to study the interactions between thermal turbulence and the rates of chemical production. Results obtained previously show that the influence of turbulence on the rate of chemical production can be neglected by a first approximation and the flow in the center line can be considered as quasi-one dimensional. The measured profiles of molecular fractions are used to test models proposed for propane combustion. It appears that, if the most recent models correctly predict the first phase of combustion, they overestimate the reaction rates at the end of combustion, especially in the case of a propane-air-heated gas mixture. In addition, it is proven that, as theory predicts, combustion augments the amplitude of temperature fluctuations present in the initial mixture. Transl. by A.R.H.

N84-24760# Middle East Technical Univ., Ankara (Turkey). Dept. of Chemical Engineering.

EVALUATION OF MULTI-DIMENSIONAL FLUX MODELS FOR RADIATIVE TRANSFER IN COMBUSTION CHAMBERS: A REVIEW **c34**

Nevin Selcuk *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)

Avail: NTIS HC A19/MF A01

In recent years, flux methods have been widely employed as alternative, albeit intrinsically less accurate, procedures to the zone or Monte Carlo methods in complete prediction procedures. Flux models of radiation fields take the form of partial differential equations, which can conveniently and economically be solved simultaneously with the equations representing flow and reaction. The flux models are usually tested and evaluated from the point of view of predictive accuracy by comparing their predictions with 'exact' values produced using the zone or Monte Carlo models. Evaluations of various multi-dimensional flux-type models, such as De Marco and Lockwood, Discrete-Ordinate, Schuster-Schwarzschild and moment, are reviewed from the points of view of both accuracy and computational economy. Six-flux model of Schuster-Schwarzschild type with angular subdivisions related to the enclosure geometry is recommended for incorporation into existing procedures for complete mathematical modelling of rectangular combustion chambers. Author

N84-24761# Middle East Technical Univ., Ankara (Turkey). Dept. of Mechanical Engineering.

A DROPLET EVAPORATION RATE CONTROLLED COMBUSTION MODEL **c34**

A. D. Bayka *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)

Avail: NTIS HC A19/MF A01

A computational model for predicting the rate of heat released during combustion of a fuel injected into a combustion chamber is proposed. In the mathematical model the burning rate was based on the ignition of combustible mixture elements formed, each having different ignition delays, depending on the state parameters they were subjected to in the combustion chamber. The rate of heat release was related to the rate of evaporation of the injected fuel. The rate of evaporation of the fuel was related to the size distribution of the fuel droplets which was divided into several groups with different diameters. The diameter and temperature histories of the droplets in each group were simultaneously obtained depending on the instantaneous droplet velocity, the rate of injection, type of nozzle, fuel and heat transferred to the evaporating droplets. The total evaporation rate of the fuel at any instant was the summation of the evaporation rates of all the droplets present in the cylinder at any time. Author

N84-24762# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

PREDICTION OF TURBULENT REACTIVE FLOW **c34**

Francis Dupoirieux *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)

Avail: NTIS HC A19/MF A01

Turbulent reactive flows are predicted by a numerical finite-volume method which is implicit with regard to the time. A model of turbulent combustion allows the analysis of reactive flows for which the mixture ratio is heterogeneous. The grid proceeding from the spatial discretization can be applied to any shape of plane or axisymmetrical duct. Numerical results are qualitatively in agreement with experiments. Moreover, this implicit method is less expensive than the equivalent explicit one concerning the time needed to reach the asymptotical regime. M.G.

N84-24763# Illinois Univ., Urbana-Champaign. Dept. of Mechanical and Industrial Engineering.

PREDICTED TF41 PERFORMANCE WITH THE AGARD RESEARCH FUEL **c28**

J. E. Peters *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 8p refs (For primary document see N84-24732 15-25)

Avail: NTIS HC A19/MF A01

Calculations are presented to predict the performance of an alternative fuel in a conventional as turbine combustor. Existing data for fuel effects on the Detroit Diesel Allison TF41 combustor, a can-annular burner, are correlated with the semi-empirical characteristic time model. The correlations are used to predict the ignition, stability and combustion efficiency performance of a proposed alternative fuel, the AGARD Research Fuel, in the TF41 combustor. Compared to standard NATO F-40 and F-35 fuels the alternative fuel provides similar combustion efficiency levels, reduced flame stability and significantly degraded ignition performance. Author

N84-24764# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France). Dept. de Mecanique et Energetique des Systemes.

AN AERODYNAMIC STUDY OF COMBUSTION IN THE COMBUSTION CHAMBERS OF TURBOMACHINES: EXPERIMENTAL AND THEORETICAL APPROACHES [ETUDE AERODYNAMIQUE DE LA COMBUSTION DANS LES FOYERS DE TURBOMACHINES:

APPROCHES EXPERIMENTALES ET THEORIQUES] c07
Guy Frager, Patrick Hebrard, Gerard Lavergne, and Ahmed Mir *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 16p refs In FRENCH (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

Instead of using local resolution methods which are often too costly at the rough-draft stage of combustor design, there is often an advantage in using either a modular or mixed method approach. In the modular approach, numerous hydraulic tunnel tests and diverse video imaging techniques supply the basic data used in the schematics of diverse combustors in the form of a combination of elementary reactors. The addition of chemical kinetics, more or less detailed, (aggregate mode, semi-aggregate, with vaporization) allows the prediction of the total performance of these various combustion chambers with good precision. In the more precise mixed method approach, only the recirculation zones are modeled by an collection of elementary reactors. The regions of direct flow (jet, swirler...) are the object of local calculation (Kappa, Epsilon) in which the behavior of the drops (size, trajectory, vaporization) is considered beginning with a collection of geometric measurements carried out at DERMES. Transl. by A.R.H.

N84-24765# Societe Nationale d'Etudes et de Construction de Moteurs d'Aviation, Moissy-Cramayel (France).
PREDICTING COMBUSTOR EFFICIENCY AND STABILITY PERFORMANCES c07
Y. Chauveau, M. Desaulty, and G. Bayle-Laboure *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 7p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The need for an increased compactness of modern combustors leads to an ever more developed optimization of these combustors, that aims at insuring the best efficiency/pollution and stability performances in the smallest possible volume. One of the cheapest ways to achieve such an optimization is to develop computer codes allowing to predict the performances of a combustor at the design stage. A computer model is presented which is based on the principle of a description of the combustor as a series of well-stirred reactors, being aerodynamically coupled with each other, and acting as reactive zones where combustion is controlled by chemical kinetics. Computed and measured emission indexes and stability limits are compared for a two-dimensional reactor simulating a combustor primary zone, as well as for a complete combustor. Author

N84-24766# Naples Univ. (Italy). Ist. di Chimica Industriale e Impianti Chimici.
CHARACTERIZATION OF HEAVY OIL SPRAYS IN ISOTHERMAL AND BURNING CONDITIONS WITH LASER LIGHT SCATTERING MEASUREMENTS IN THE SIDEWARD REGION
F. Beretta (CNR), A. Cavaliere (CNR), and A. DAlessio *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 8p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

A drop sizing technique for slightly absorbing liquid fuel is proposed. The technique relies on laser light scattering measurements at fixed scattering angle in the sideward region and it exploits the effect of light absorption of the refracted rays that pass through the droplets. A theoretical calibration curve, computed on the ground of the geometrical optics theory, relate a measurable plane polarization state (the gamma polarization ratio) with droplet dimensions for differential level of liquid fuel transparencies. The reasonably good approximation of the geometrical optics to the exact solution of Maxwell equation for a plane electromagnetic field incident on a sphere is also discussed. Furthermore the measure procedure and the sensitivity of the technique is illustrated through selected experimental examples. For this purpose heavy oil sprays have been generated by an air assisted nozzle on a vertical unconfined burner in isothermal and burning conditions. The radial distribution of droplet sizes and polarization ratios allow a characterization of spray evolution in the early regions of flame. M.G.

N84-24767# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aero Propulsion Lab.
UTILIZATION OF LASER DIAGNOSTICS TO EVALUATE COMBUSTOR MODELS
W. M. Roquemore, R. P. Bradley, J. S. Stutrud, C. M. Reeves, and C. A. Obringer *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 21p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

An overview of results obtained in the Combustion Model Evaluation research program is presented. The characteristics of a bluff body research combustor used in this program are described. Data obtained with a laser Doppler anemometer system and a coherent anti-Stokes Raman scattering system are presented. These results and those obtained with conventional probe devices and flow visualization techniques are compared to both time averaged and time dependent calculations of the near wake region of the bluff body flow field. The results of computer model experiments of the flow field for different diameter bluff bodies are also presented. Author

N84-24768# Sheffield Univ. (England). Dept. of Chemical Engineering and Fuel Technology.
PROBLEM INDEPENDENT NUMERICAL SIMULATION OF TWO-PHASE FLOW IN COMBUSTORS c34
W. H. Ayers, F. Boysan, B. C. R. Ewan, and J. Swithenbank *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 8p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

The application of 3-D computer codes to isothermal and combusting two phase flows is discussed. In particular, a number of aspects of one specific code are presented including the coupling of flow and droplet motions and the interactive setting up procedure to define an arbitrary geometry. Calculated and measured velocity fields are shown for the isothermal flow in a coaxial dump combustor and results are presented for the combustion case using a baffle stabilizer. M.G.

N84-24636*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INTERACTION OF ATOMIC OXYGEN WITH SOLID SURFACES AT ORBITAL ALTITUDES (A0114)
John C. Gregory (Alabama Univ.) and Palmer N. Peters *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 14-18 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 07D

N84-24904# Tennessee Technological Univ., Cookeville. Dept. of Mechanical Engineering.
A PERTURBATION METHOD FOR SELF-COUPLED COMBUSTION-INSTABILITY PROBLEMS Abstract Only
Asghar Googerdy and John Peddieson, Jr. *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 241 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 21/2

N84-25592*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MASS SPECTROMETER FOR SIMULTANEOUS DETECTION OF IONS OVER WIDE RANGE OF MASS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 10-11 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 07D

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-24769 National Physical Lab., Teddington (England). Div. of Materials Applications.
SOME ASPECTS OF CREEP IN NICKEL-BASE SUPER ALLOYS

Pamela J. Henderson Jan. 1984 138 p refs
(NPL-DMA(A)-72; ISSN-0143-7313) Avail: Issuing Activity

High temperature creep tests were performed on the nickel-base superalloy IN738LC in directionally solidified and conventionally cast forms. The threshold stress for creep and the dislocation recovery kinetics were determined by using the numerical method of analysis to extrapolate data from stress-drop experiments. The variations in the threshold stress for creep and recovery kinetics with initial particle size, temperature and applied stress and throughout the creep life were measured. It was found that the variation in the threshold stress for creep with temperature was much less than that previously estimated by visual inspection of the stress-drop data and that the recovery kinetics increased dramatically with increasing temperature. During creep tests the threshold stress for creep remained fairly constant or decreased slightly while the recovery kinetics increased significantly, scaling with the increasing creep rates. R.J.F.

N84-24770 Defence Research Information Centre, Orpington (England).
THE NEUTRON INDUCED EMBRITTLEMENT OF REACTOR PRESSURE VESSEL STEELS AND FERRITIC ALLOYS Annual Report
J. Ahlf, D. Bellmann, G. Richter, F. J. Schmitt, W. Spalthoff, R. Wagner, A. Beaven, F. Frisius, R. Kampmann, and D. Bunemann Jan. 1984 42 p refs Transl. into ENGLISH of GKSS (Geesthacht, West Germany), 1982 p 48-62
(AD-B080746; DRIC-T-7042; BR90743) Copyright. Avail: Issuing Activity

The problem of neutron inducted embrittlement of reactor pressure vessel steels is discussed. Reactor pressure vessel steels tend to become more brittle if they are irradiated with fast neutrons. This can result in an increase in the brittle fracture transition temperature, and a decrease in notch fracture strength. The extent of embrittlement depends on chemical composition, the temperature at which radiation takes place, the fluence and energy spectrum of the fast neutrons, and the flux density of the fast neutrons. Under normal operating conditions in a nuclear power station, the problem of embrittlement does not arise. R.J.F.

N84-24771# Technische Hogeschool, Delft (Netherlands). Interdisciplinary Dept. of Metals Science and Technology.
RAPID SOLIDIFICATION RESEARCH ON ALUMINUM ALLOYS AT DELFT UNIVERSITY OF TECHNOLOGY
Laurens Katgerman May 1984 19 p
Avail: NTIS HC A02/MF A01

This bibliography lists 75 reports, posters, presentations and papers on the rapid solidification of aluminum alloys. Aspects covered include process modelling and development: characterization and properties of as-quenched alloys; and structure and properties after consolidation. A.R.H.

N84-24772*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE OF THERMAL BARRIER COATINGS IN HIGH HEAT FLUX ENVIRONMENTS
Robert A. Miller and Christopher C. Berndt (Cleveland State Univ.) 1984 13 p refs Presented at the Intern. Conf. on Metallurgical Coatings, San Diego, Calif., 9-13 Apr. 1984
(NASA-TM-83663; E-2010; NAS 1.15:83663) Avail: NTIS HC A02/MF A01 CSCL 11F

Thermal barrier coatings were exposed to the high temperature and high heat flux produced by a 30 kW plasma torch. Analysis of the specimen heating rates indicates that the temperature drop across the thickness of the 0.038 cm ceramic layer was about 1100 C after 0.5 sec in the flame. An as-sprayed ZrO_2-8%Y_2O_3 specimens survived 3000 of the 0.5 sec cycles with failing. Surface spalling was observed when 2.5 sec cycles were employed but this was attributed to uneven heating caused by surface roughness. This surface spalling was prevented by smoothing the surface with silicon carbide paper or by laser glazing. A coated specimen with no surface modification but which was heat treated in argon also did not surface spall. Heat treatment in air led to spalling in as early as 2 cycle from heating stresses. Failures at edges were investigated and shown to be a minor source of concern. Ceramic coatings formed from ZrO_2-12%Y_2O_3 or ZrO_2-20%Y_2O_3 were shown to be unsuited for use under the high heat flux conditions of this study. Author

N84-24773*# National Aeronautics and Space Administration. Manned Spacecraft Center, Langley Station, Va.
SEPARATION PROCESSES DURING BINARY MONOTECTIC ALLOY PRODUCTION
Donald O. Frazier, Barbara R. Facemire, William F. Kaukler, William K. Witherow, and Ursula Fanning Apr. 1984 29 p refs
(NASA-TM-82579; NAS 1.15:82579) Avail: NTIS HC A03/MF A01 CSCL 11F

Observation of microgravity solidification processes indicates that outside of sedimentation, at least two other important effects can separate the phases: critical-point wetting and spreading; and thermal migration of second-phase droplets due to interfacial tension gradients. It is difficult to study these surface tension effects while in a unit gravity field. In order to investigate the processes occurring over a temperature range, i.e., between a consolute point and the monotectic temperature, it is necessary to use a low-gravity environment. The MSFC drop tube (and tower), the ballistic trajectory KC-135 airplane, and the Space Shuttle are ideal facilities to aid formation and testing of hypotheses. Much of the early work in this area focuses on transparent materials so that process dynamics may be studied by optical techniques such as photography for viewing macro-processes; holography for studying diffusional growth; spinodal decomposition and coalescence; ellipsometry for surface wetting and spreading effects; and interferometry and spectroscopy for small-scale spatial resolution of concentration profiles. A.R.H.

N84-24774*# General Electric Co., Evendale, Ohio.
EFFECTS OF SURFACE CHEMISTRY ON HOT CORROSION LIFE Annual Report
R. E. Fryxell Jun. 1984 57 p refs
(Contract NAS3-23926)
(NASA-CR-174683; NAS 1.26:174683; R84AEB422; AR-1) Avail: NTIS HC A04/MF A01 CSCL 11F

Baseline burner rig hot corrosion with Udimet 700, Rene' 80; uncoated and with RT21, Codep, or NiCoCrAlY coatings were tested. Test conditions are: 900C, hourly thermal cycling, 0.5 ppm sodium as NaCl in the gas stream, velocity 0.3 Mach. The uncoated alloys exhibited substantial typical sulfidation in the range of 140 to 170 hours. The aluminide coatings show initial visual evidence of hot corrosion at about 400 hours, however, there is no such visual evidence for the NiCoCrAlY coatings. The turbine components show sulfidation. The extent of this distress appeared to be inversely related to the average length of mission which may, reflect greater percentage of operating time near ground level or greater percentage of operation time at takeoff conditions (higher temperatures). In some cases, however, the location of maximum distress did not exhibit the structural features of hot corrosion. E.A.K.

N84-24775# Technische Hochschule, Aachen (West Germany). Inst. fuer Eisenhuettenkunde.
STUDY ON THE EFFECTS OF NIOBIUM, VANADIUM, TITANIUM AND/OR RARE EARTH METALS ON THE PROPERTIES AND PROCESSING OF HIGH-TENSILE, WELDABLE STRUCTURAL STEELS Final Report, Sep. 1982
Winfried Dahl and Heiko Beenken Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 151 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-318; ISSN-0340-7608) Avail: NTIS HC A08/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 31,50

A literature review shows that the microalloyed element niobium is mainly used also in combination with vanadium, because it has a strong grain refining effect in small quantities. Vanadium contributes mainly to an increase in strength via precipitation

hardening, while titanium is employed because of its influence on sulfide form, in addition to its grain refining and precipitation hardening effects. Even slight quantities of rare earth metals diminish the anisotropy of toughness properties and lower the tendency to lamellar tearing. If a suitable combination of microalloyed elements and rolling parameters is used, excellent strength and toughness data can be ahieved, which are maintained during processing. A.R.H.

N84-24776# Vereinigte Aluminium-Werke A.G., Bonn (West Germany). Leichtmetall-Forschungsinst.

MANUFACTURING AND PROPERTIES OF ALUMINUM SHEET FROM MIXED SCRAP MATERIALS Final Report, Dec. 1980

Edgar Lossack Bonn Bundesministerium fuer Forschung und Technologie. Jan. 1984 69 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie.

(BMFT-FB-T-84-007; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14,50

Mixed old scrap consists of non separable origin foundry alloys and wrought alloys. Melts from such scrap have to be blended with high amounts of primary metal to correct the composition for use in usual alloy fields. The investigation had to find out if mixed old scrap could be used for sheet manufacturing without blending with primary metal at great extent. Two model compositions were chosen which referred to possible scrap mixtures. By d.c. casting into slabs, hot rolling and cold rolling sheet can be manufactured. In selected tempers this uncommon sheet showed good strength and formability properties. The existing corrosion problems with the sheet can be solved by suitable coating or preferably by cladding with selected clad alloys. R.J.F.

N84-24777# Technical Research Centre of Finland, Espoo. Metals Lab.

DETERMINATION OF WELD HYDROGEN CONTENT

Risto Karppi, Jouko Ruusila, Kunihiko Satoh (Osaka Univ.), Masao Toyoda (Osaka Univ.), and Karri Vartiainen Nov. 1983 25 p refs Sponsored by Academy of Finland and Ministry of Education, Science and Culture of Japan

(VTT-240; ISBN-951-38-1910-8; ISSN-0358-5077) Avail: NTIS HC A02/MF A01; Technical Research Centre of Finland, Espoo, FIM 25

Correlation between the initial diffusible hydrogen content of welds measured with the ISO-mercury test and the Osaka University mercury test are discussed. A few factors in the test procedure were found to have a great influence on the determination of the hydrogen content. The result was dependent on the material of the specimen, the degassing temperature prior to the test and the surface condition of the test specimen. The data from the quenched specimens are not truly representative of the hydrogen content responsible for cold cracking. An analytical method for determining the remaining diffusible hydrogen content at 100 C was also studied. The results show that this analytical method suggested recently by Terasaki et al, is very applicable. Author

N84-24778# Technical Research Centre of Finland, Espoo. Metals Lab.

ION PLATING AS A DEPOSITION METHOD FOR TRIBOLOGICAL COATINGS Ph.D. Thesis - Helsinki Univ.

Heikki Sundquist Nov. 1983 51 p refs Sponsored by Finnish Academy of Sciences

(VTT-13; ISBN-951-38-1915-9; ISSN-0358-5069) Avail: NTIS HC A04/MF A01

The applicability of the ion plating process for deposition of tribological coatings was surveyed. Coatings chosen for the experimental work were aluminum bronze and titanium nitride, the former being deposite by triode ion plating and the latter by reactive triode ion plating. A slug feed resistive evaporation method was introduced for the ion plating of copper-aluminum alloy coatings. The structure and tribological properties of the various coatings produced with different evaporation rates and ion bombardment conditions were studied. The beneficial effects of the interrupted growth resulting from the pulsed evaporation induced by a slug feeding mechanism was demonstrated. The tribological properties of ion plated titanium nitride coatings were evaluated both in laboratory tests and industrial metal working processes. An abrasive wear mechanism for hard coatings on soft substrates was suggested, and the benefits of titanium nitride coating for wear protection were shown. Also the commercial applicability of this coating for industry was reviewed. R.J.F.

N84-24779# Oxford Univ. (England). Dept. of Engineering Science.

THE EFFECT OF COOLING RATE FROM THE GAMMA-PHASE ON THE STRAIN-RATE SENSITIVITY OF A URANIUM 2w/o MOLYBDENUM ALLOY

G. A. C. Boyd and J. Harding 1983 52 p refs

(QUEL-1492/83) Avail: NTIS HC A04/MF A01

Tensile tests were performed at strain rates from 0.0001 to about 2000/a and temperatures from -150 C to +250 C on a Uranium 2(w)/o Molybdenum alloy which was aged for 2 hours at 500 C after a fast gas cool from the gamma-phase at a controlled rate of 40 C/minute. The results are compared with those for standard as-extruded material which had received the same aging treatment. Stress-strain curves are presented and the effect of strain rate and temperature on the flow stress, the ultimate tensile stress, and the elongation to fracture is determined. A thorough structural characterization of the specimen materials, using X-ray analysis and scanning and transmission electron microscopy, allows the different mechanical responses to be related to the corresponding microstructural state of the material. Flow stress data at different temperatures and strain rates are analyzed in terms of the theory of thermally-activated flow. Estimates were made of the various activation parameters. R.J.F.

N84-24780# Birmingham Univ. (England). Dept. of Physical Metallurgy and Science of Materials.

EFFECT OF PREFERRED ORIENTATION ON CRACK GROWTH PROPERTIES OF Ti-6Al-4V ALLOYS, PART 2 Final Report

D. S. Jasim, C. J. Beevers, and W. B. Hutchinson Sep. 1981 180 p refs 2 Vol.

(Contract MOD-AT-2027/016/MAT)

(BR89101-Pt-2) Avail: NTIS HC A09/MF A01

Fatigue tests were carried out on specimens machined from a heavily textured plate of Ti-6Al-4V. The specimens had the six principal orientations ST, SL, LS, TS, TL and LT and the crack growth was monitored by the dc potential drop method. A highly orientation sensitive fatigue response was observed; the highest threshold level in LT was about twice the lowest threshold in ST. This anisotropic behavior was rationalized in terms of the anisotropy of slip activity at the crack tip when the reverse plasticity is contained within individual grains, with a superimposed effect of mechanical fibering due to the alignment of the microstructure in the rolling direction. This latter effect was largely significant in ST and SL orientations where fatigue crack growth was predominantly along the planar alpha/beta boundaries. R.J.F.

N84-24781# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

FRACTURE TOUGHNESS AND CORROSION PROPERTIES OF THE ALUMINUM PLATE ALLOYS 7010-T651 AND 7150-T6E189

W. G. J. Thart and L. Schra 1 Dec. 1982 47 p refs

(Contract NIVR-1906)

(NLR-TR-82125-U) Avail: NTIS HC A03/MF A01

A comparative experimental investigation was done on the advanced plate alloys 7010-T651 from ALCAN and 7150-T6E189 from ALCOA. The mechanical properties, fracture toughness and corrosion properties were determined. The most notable finding was the excellent fracture toughness of alloy 7150-T6E189 combined with a high tensile strength. The resistance to stress corrosion crack initiation of the two alloys was almost similar, while the stress corrosion crack growth rate was evidently higher in alloy 7150-T6E189. Author

N84-24782# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ENGINEERING PROPERTY COMPARISONS OF PM ALLOY X7091-T7E69 AND IM ALLOY FORGINGS
Jun. 1982 86 p refs
(Contract NIVR-1743)
(NLR-TR-82054-U) Avail: NTIS HC A05/MF A01

The engineering properties of powder metallurgy (PM) alloy X7091-T7E69 forgings were compared with those of forgings of the ingot metallurgy (IM) alloys 7075-T73, 7175-T736, 7050-T736 and 7010-T736. The properties considered were: strength, fracture toughness, fatigue crack propagation under constant amplitude and flight simulation loading, stress corrosion crack initiation and propagation resistance, and exfoliation corrosion. The most important findings were: substantially better combination of strength and resistance to stress corrosion and exfoliation corrosion for the PM alloy as compared to the IM alloys; a fracture toughness of the PM alloy lower than or similar to that of the IM alloys; a dramatically low spectrum fatigue crack propagation life for the PM alloy; only minor differences between the IM alloys. R.J.F.

N84-24783# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
EFFECT OF COOLING RATE ON CORROSION PROPERTIES AND MICROSTRUCTURE OF HIGH STRENGTH ALUMINUM ALLOYS
W. G. J. Thart, H. J. Kolkman, and L. Schra 14 Oct. 1982 47 p refs
(Contract NIVR-1869)
(NLR-TR-82105-U) Avail: NTIS HC A03/MF A01

The Jominy end-quench test was applied to rods of the aluminium alloys 7010 and X7091 to obtain a decreasing cooling rate over the length of the rods. After heat treating to a high strength and an overaged condition, the corrosion properties and the microstructure were determined related to the cooling rate. No influence of cooling rate on stress corrosion crack initiation life and a slight influence of cooling rate on exfoliation corrosion resistance were established. R.J.F.

N84-24784# McDonnell Aircraft Co., St. Louis, Mo.
MEASUREMENT OF HYDROGEN IN HIGH STRENGTH STEELS USING THE BARNACLE ELECTRODE Final Report, May 1982 - May 1983
R. J. Kotfila Jun. 1983 43 p
(Contract N62269-82-C-0231)
(AD-A139655; NADC-81294-60) Avail: NTIS HC A03/MF A01 CSCL 11/6

The objectives of this program are to demonstrate the effectiveness of the barnacle electrode (BE) for measuring mobile hydrogen and to correlate the levels of such hydrogen with the tendency for delayed failure of two high strength steels, AISI 4340 at the 260-280 ksi (1793-1931 MPa) ultimate strength level and 300M at the 280-300 ksi (1931-2068 MPa) ultimate strength level. These steels were bright cadmium plated to introduce hydrogen into the substrate and then baked for periods of 2 to 100 hours. The notch stress rupture stress to produce failure in 200 hours was used to measure susceptibility to hydrogen embrittlement. The results indicate that the BE can effectively measure mobile hydrogen and susceptibility to delayed failure can be correlated with BE measurements. Confidence in the use of the BE system can be increased by delineating the cause for the observed variation in current density readings. Author (GRA)

N84-24785# Naval Research Lab., Washington, D. C.
DRAFT STANDARD METHOD OF TEST FOR PLANE-STRAIN STRESS-CORROSION-CRACKING RESISTANCE OF METALLIC MATERIALS IN MARINE ENVIRONMENTS
J. A. Hauser, II , R. W. Judy, Jr., and T. W. Crooker 22 Mar. 1984 17 p
(AD-A139752; NRL-MR-5295) Avail: NTIS HC A02/MF A01 CSCL 11/6

High-strength alloys exposed to a marine environment may undergo stress-corrosion-cracking (SCC). To obtain a reliable data base of SCC information, it is necessary to formulate standard methods of test to assure uniformity of results. This document sets forth recommended procedures for the two most popular SCC tests methods, single-edge-notched cantilever bend and wedge-opening-loaded (WOL). Author (GRA)

N84-24786# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.
BIMETAL AND MULTIMETAL GALVANIC CORROSION PREDICTION USING LONG- AND SHORT-TERM POLARIZATION CURVES Research and Development Report
J. R. Scully Feb. 1984 71 p
(DA Proj. F71-541)
(AD-A139893; DTNSRDC/SME-83/85) Avail: NTIS HC A04/MF A01 CSCL 11/6

Long-term potentiostatic polarization curves of up to 120-days duration were developed for the following materials: 90-10 copper-nickel; Monel 400; Inconel 625; Navy M-bronze; nickel-aluminum-bronze; and HY-80 steel. In addition, potentiostatic polarization curves have been developed for Titanium-50, 70-30 copper-nickel, and anode grade zinc. Also, short-term potentiodynamic polarization curves were developed at four scan rates and two pre-exposure levels on specimens of all but the last three of the above materials. The scan rates utilized ranged from 0.5 to 100 volts/hour and pre-exposure times were 1 hour and 120 days. Long-term potentiostatic data was used to predict the behavior of actual two and three metal couples. The predictions had a level of accuracy equal to, or superior than, the conventional galvanic corrosion prediction techniques utilizing galvanic corrosion rate tables or corrosion potential differences. Potentiodynamic data from 120-day pre-exposed, low scan rate tests has demonstrated some utility in predicting bimetal couple behavior. GRA

N84-24787# Massachusetts Inst. of Tech., Cambridge.
STUDIES OF METASTABLE MICROCRYSTALLINE AND GLASSY ALLOYS Final Report
R. C. OHandley, Nicholas J. Grant, K. M. Johnson, R. M. Latanision, and B. C. Giessene Mar. 1984 14 p
(Contract DAAG29-80-K-0088)
(AD-A139941; ARO-17643.11-MS) Avail: NTIS HC A02/MF A01 CSCL 11/6

Results of broad inter- and intra-disciplinary research on metastable micrcrystalline and glassy alloys are reported. Progress is noted in processing of R.S. aluminum alloys and in understanding and improving their corrosion resistance and mechanical properties. Ne metallic glasses with improved magnetic properties are described. Significant advances in understanding of bonding, glass formation stability and transformation in glassy materials through molecular-orbital cluster calculations are summarized.
Author (GRA)

N84-24788# Brown Univ., Providence, R. I.
PREDICTION OF CREEP AND CREEP RELAXATION OF AL 2618 UNDER VARIABLE MULTIAXIAL STRESSES Final Report, 10 Aug. 1981 - 10 Feb. 1984
W. N. Findley Mar. 1984 7 p
(Contract DAAG29-81-K-0138)
(AD-A139950; ARO-17741.8-EG) Avail: NTIS HC A02/MF A01 CSCL 11/6

This report presents the results of studies of stress relaxation experiments in tension at low stresses; aging creep test; compression creep tests; nonproportional loading and unloading at low stresses; prediction from a viscous-viscoelastic model of the multiple-step non-proportional loading experiments at low stresses; the possibility of an upper limit to the recoverable strain, and the possible applicability of other theories to prediction of creep under complex stress histories. Author (GRA)

N84-24789# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF COLD WORK ON MARTENSITIC TRANSFORMATIONS IN CU-ZN-AL SHAPE MEMORY ALLOYS M.S. Thesis
S. M. Sullivan Dec. 1983 127 p

(AD-A139975) Avail: NTIS HC A07/MF A01 CSCL 11/6

Samples of martensitic Cu-Zn-Al shape memory alloy were deformed by cold rolling below Mf (martensite finish temperature). The effect of cold work upon the reaction kinetics of parent to product and product to parent transformations was studied utilizing differential scanning calorimetry methods. Characterization of the microstructure of selectively deformed shape memory alloy samples was accomplished by optical and transmission electron microscopy techniques. Correlation of microstructure and substructural conditions with associated transformation trends provided an understanding of the effect of cold work, as characterized by stress induced morphology, upon shape memory behavior. Author (GRA)

N84-24790# Virginia Polytechnic Inst. and State Univ., Blacksburg.
ANODIC OXIDE FORMATION ON Ti-6Al-4V IN CHROMIC ACID FOR ADHESIVE BONDING Interim Report, 30 Sep. 1982 - 30 Dec. 1983
A. M. T. Cheng and D. W. Dwight Mar. 1984 114 p
(Contract N00014-82-K-0185)
(AD-A140057; VPI-E-84-8) Avail: NTIS HC A06/MF A01 CSCL 11/6

Chromic acid anodization (CAA) of Ti-6Al-4V alloy has been shown to produce desirable oxide for adhesive bonding. The highly porous oxide layer provides mechanical interlocking with the adhesive or the primer forming a much stronger interface. This leads to stronger and more durable bond than most other surface pretreatments. Since anodization is a electrochemical process, electrochemical methods are used to elucidate the mechanism and kinetics of the oxide formation. From galvanostatic anodization, the preimmersion oxide thickness is calculated to be in the order of 10 Angstrom. Oxygen evolution is dominant at above 10 V. Oxide breakdown or cracking was observed at potentials above 10 V and at current density above 11 mA/sq cm. Hydrofluoric acid was found to be essential in the initiation and formation of pores desirable for adhesive bonding. Without HF addition, the oxide formed was compact and uniform regardless of anodizing conditions (before breakdown). In the presence of HF, porous oxide was obtained with pore size distribution increased with temperature and HF concentration. Author (GRA)

N84-24791# Los Alamos Scientific Lab., N. Mex.
ISOTHERMAL CALORIMETRIC INVESTIGATION OF A REVERSIBLE REACTION IN RAPIDLY SOLIDIFIED Fe40Ni40B20
J. R. Cost, R. O. Elliott, and J. T. Stanley 1983 6 p Presented at the Symp. on Rapidly Solidified Metastable Mater., Boston, 15-17 Nov. 1983
(Contract W-7405-eng-36)
(DE84-006013; LA-UR-84-136; CONF-831175-78) Avail: NTIS HC A02/MF A01

A method is described for isothermal calorimetric measurement of time dependent reversible reactions in which the rate of heat flow is small compared to the noise and zero drift of the measurement. Results using this method are presented which measure enthalpy changes associated with reversible phase changes in a rapidly solidified Fe40Ni40B20 alloy. DOE

N84-24792# Pacific Northwest Lab., Richland, Wash.
CORROSION OF CARBON STEEL IN OXIDIZING CAUSTIC SOLUTIONS
J. R. Divine and W. M. Bowen Sep. 1983 33 p refs Presented at CORROSION/84 Intern. Forum and Exhibition, New Orleans, 2-6 Apr. 1984
(Contract DE-AC06-76RL-01830)
(DE84-000209; PNL-SA-11667; CONF-840405-2) Avail: NTIS HC A03/MF A01

A series of tests were completed on a range of proposed waste compositions at temperatures up to 100(0)C. These tests sought data on uniform corrosion, pitting, and stress corrosion cracking. No indication of the latter two types of corrosion were observed within the test matrix. Corrosion rates after four months were generally below 25 (MU)m/y. By the end of twelve months all results, except for very concentrated mixtures, were below 13 (MU)m/y. Prediction equations were generated from a model fitted to the data. The equations provide a rapid means of estimating the corrosion rate for waste compositions and temperatures within the test limits. DOE

N84-24793# California Univ., Livermore. Lawrence Livermore Lab.
THE YIELD STRESS OF TYPE 21-6-9 STAINLESS STEEL OVER A WIDE RANGE OF STRAIN RATE (10(-5) TO 10(4) s(-1)) AND TEMPERATURE
M. E. Kassner and R. D. Breithaup 23 Sep. 1983 9 p refs Presented at the 3rd Intern. Conf. on Mech. Properties of Mater. at High Rates of Strain, Oxford, 9-12 Apr. 1984
(Contract W-7405-eng-48)
(DE84-000914; UCRL-89779; CONF-840411-3) Avail: NTIS HC A02/MF A01

Hopkinson split-bar tests were performed on Type 21-6-9 austenitic stainless steel from ambient temperature to 1023 K. These high-strain-rate tests (10(2) to 10(4) s(-1) were compared with lower-strain-rate tests (10(-4) s(-1)). The results indicate that over this temperature range, the strain-rate sensitivity of 21-6-9 is not strongly dependent on the strain rate. This suggests that the mechanism(s) of plastic flow at the higher rates is similar to that at the lower rates. This contention was corroborated by transmission electron microscopy. DOE

N84-24794# Argonne National Lab., Ill. Materials Science and Technology Div.
THE INFLUENCE OF Al2O3 AND SURFACE SCALES ON ALLOY DEGRADATION AT ELEVATED TEMPERATURES
D. J. Baxter and K. Natesan Oct. 1983 11 p refs Presented at the Conf. on Elec. Utility Res., Chicago, Apr. 1984
(Contract W-31-109-eng-38)
(DE84-007299; CONF-840469-2) Avail: NTIS HC A02/MF A01

The resistance to degradation of structural alloys at elevated temperatures depends largely on the protective capacity of thermally formed surface oxide scales. The rate of growth and resistance to breakdown of oxide scales govern their ability to provide protection. Properties of Al2O3 scales are discussed and, where appropriate, comparisons to Cr2O3 are made. The requirements for Al2O3 formation in terms of alloy chemistry are presented. Particular attention is paid to the mechanical properties and mechanical behavior of Al2O3 and to the stability of Al2O3 in environments containing contaminants that have the potential to initiate breakaway corrosion. DOE

N84-24795# Argonne National Lab., Ill. Materials Science and Technology Div.
EFFECT OF SULFURIC ACID, OXYGEN, AND HYDROGEN IN HIGH-TEMPERATURE WATER ON STRESS CORROSION CRACKING OF SENSITIZED TYPE 304 STAINLESS STEEL
W. E. Ruther, W. K. Soppet, G. Ayrault, and T. R. Kassner Jun. 1983 24 p refs Presented at the Corrosion Conf., Anaheim, Calif., 18-22 Apr. 1983 Submitted for publication Sponsored in part by US Nuclear Regulatory Commission
(Contract W-31-109-eng-38)
(DE84-007276; CONF-830445-5) Avail: NTIS HC A02/MF A01

The influence of dissolved oxygen and hydrogen and dilute sulfuric acid in 289(0) C water on the stress-corrosion-cracking susceptibility of lightly and moderately sensitized Type 304 stainless steel was determined in constant-extension-rate tensile (CERT) tests. The CERT parameters and the fracture surface morphologies were correlated with the concentrations of dissolved oxygen and sulfate, and the electrochemical potentials of platinum and Type 304 stainless steel electrodes in simulated boiling-water reactor (BWR) environments. A particularly high susceptibility to intergranular cracking was found for the steel in the lightly sensitized condition at oxygen concentrations between approx. 0.05 and 0.2 ppM under slightly acidic conditions (pH approx. 6.0 at 25(0)C), which may, in part, account for the pervasive nature of intergranular cracking in boiling water reactor piping systems. Scanning-transmission electron microscopy analyses revealed significant differences between samples in the lightly and the moderately sensitized condition with respect to the width, but not

the depth, of the chromium-depleted region at the grain boundaries. DOE

N84-24796# Argonne National Lab., Ill. Materials Science and Technology Div.
IN-SITU MEASUREMENTS OF BRONZE DETERIORATION
C. Arthur Youngdahl, David S. Kupperman, and Karl J. Reimann Feb. 1984 3 p refs Presented at the NADAP Task Group G Peer Review Meeting, Burlington, Vt., 14-17 Feb. 1984
(Contract W-31-109-eng-38)
(DE84-007300; CONF-840269-1) Avail: NTIS HC A02/MF A01

Bronze structures exposed out of doors suffer corrosion damage that is believed to be greatly accelerated by acid precipitation. The estimation of the rate of loss of valuable cultural resources composed of bronze and of the possible beneficial effects of mitigation of acid deposition is an important objective of Task Group G. To support a survey of representative populations of existing bronze structures, nondestructive instrumental methods are needed that are rapid as well as comprehensive. This task explores the applicability of ultrasonic and eddy current methods to such assessment. DOE

N84-24797# Brookhaven National Lab., Upton, N. Y.
DETERMINING OF SURFACE OXIDE COMPOSITIONS ON ALLOY 600 USING RUTHERFORD BACKSCATTERING
A. L. Hanson, H. S. Isaacs, and H. W. Kraner 1984 18 p refs Presented at the NACE Corrosion Intern. Forum and Exhibition, New Orleans, 1-6 Apr. 1984 Sponsored in part by Electric Power Research Inst., Palo Alto, Calif.
(Contract DE-AC02-76CH-00016)
(DE84-002872; BNL-33830; CONF-840405-5) Avail: NTIS HC A02/MF A01

The surface composition of oxides formed on Alloy 600 under conditions similar to those in the primary side of PWR heat exchangers has been studied as a function of potential using Rutherford backscattering and proton inelastic scattering. Electropolished samples of Alloy 600 were exposed at several potentials to a solution of 0.18M H3BO3 (2000 ppM B) with 0.28M LiOH (1.4 ppM Li) at 300(0)C for 450 hours. The potentials relative to an internal hydrogen electrode ranged from -.09 to 750 mV. RBS analysis showed little or no oxide formation on samples exposed at 0 mV. Above 0 mV oxide layers formed whose thicknesses increased with potential. In addition the RBS showed a significantly enhanced concentration of aluminum and silicon in oxide. Both the oxygen and the sum of the aluminum and silicon content appeared to maintain a fixed surface concentration independent of the oxide thickness. Boron and lithium concentration were analyzed with proton inelastic scattering. No lithium was found in any sample. The boron concentration was found to follow the thickness of the oxide. DOE

N84-24798# Ames Lab., Iowa. Dept. of Chemistry.
ELECTROCHEMICAL AND SURFACE STUDIES OF THE DEPOSITION OF MERCURY AND SELENIUM AT A GOLD ELECTRODE M.S. Thesis - Iowa State Univ.
Lois A. Schadewald Jan. 1984 101 p refs
(Contract W-7405-eng-82)
(DE84-007209; IS-T-1112) Avail: NTIS HC A06/MF A01

The term underpotential deposition (UPD) refers to the electrodeposition of metal ions from solution onto substrates of noble meals at potentials positive to the thermodynamic Nernst potential for bulk deposition of that particular metal. The research described in this dissertation involves the study of the deposition of Hg(II) and Se(IV) at polycrystalline gold electrodes by cyclic voltammetry, flow through coulometry and various surface spectroscopies. The work described here has been performed over a higher range of concentration than was previously studied. Also, this work includes investigations utilizing Scanning Electron Microscopy (SEM), Auger Electron Spectroscopy (AES), and Electron Spectroscopy for Chemical Analysis. DOE

N84-24799# Bell Telephone Labs., Inc., Murray Hill, N. J.
SPIN CORRELATIONS NEAR THE FERROMAGNETIC TO SPIN GLASS CROSSOVER
G. Aeppli, S. M. Shapiro (Brookhaven National Lab., Upton, N.Y.), H. Maletta (IFF-KFA, Julich, West Germany), R. J. Birgeneau (Massachusetts Inst. of Tech., Cambridge), and H. S. Chen Jan. 1984 24 p refs Presented at the 29th Ann. Conf. on Magnetics and Magnetic Mater., Pittsburgh, 8 Nov. 1983
(Contract DE-AC02-76CH-00016)
(DE84-007385; BNL-34251; CONF-831187-18) Avail: NTIS HC A02/MF A01

Neutron scattering of two very different alloys which undergo transitions from ferromagnetic like (FM) to spin glass (SG) states as the temperature is reduced were studied. The alloys are Eu/sub x/Sr/sub 1-x/S, a crystalline insulator, and (Fe/sub 1-y/Mn/sub y/)75P16B6A13, an amorphous metal, and their FM-SG multicritical points are at x approx. - 0.50, T=4K and y approx. = 0.35, T=42K respectively. The neutron scattering data show that their spin correlations are similar in particular, for the samples near the multicritical points and a single Lorentzian described the magnetic scattering very well. Its width kappa corresponds to a ferromagnetic correlation length xi which, as T is reduced, first increases to a value indistinguishable from infinity, and then decreases to a finite value, as expected for a ferromagnet which evolves into a reentrant spin glass. As the Fe or Eu content is raised, the scattering function at low temperatures deviates increasingly from the Lorentzian form, and is better described by a power law Q/sup (-) (ALPHA)/ with 2 < (ALPHA) < 3. No evidence is found for coexistence of ferromagnetic order with freezing of the transverse spin components It is argued that the zero field Gabay-Toulouse state cannot exist in real magnets. The random fields which arise when ferromagnetic and spin-glass order parameters are coupled together are explained. DOE

N84-24800# Rockwell International Corp., Golden, Colo. Energy Systems Group.
COMPUTERIZED VERSION OF THE SUMMARY OF BINARY PHASE DIAGRAMS
James E. Selle 10 Mar. 1984 237 p refs
(Contract DE-AC04-76DP-03533)
(DE84-009405; RFP-3610) Avail: NTIS HC A11/MF A01

Simplification of presenting Binary phase diagram information was undertaken and a wall chart summary of Binary Phase Diagrams was developed. With this wall chart, one could rapidly search through the diagrams available for a given element and select only those diagrams displaying certain features. With the desk top computer, conversion of the data on the wall charts to a computerized format has become practical. This conversion was accomplished and the data in this format, are presented the method used described, and uses of this type system outlined. DOE

N84-24801# Deutsche Gold- und Silber-Scheideanstalt, Frankfurt am Main (West Germany).
THE QUICK AND COMPLETE RECOVERY OF THE PRECIOUS METALS OF LOW-GRADE SWEEPS AND SCRAP Final Report, Jun. 1982
Volker Jung Bonn Bundesministerium fuer Forschung und Technologie Jan. 1984 35 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-003; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 7,50

New techniques to improve the recovery of precious metals in copper using a blast furnace are discussed. The precious metal-bearing copper bullions were treated in a converter for separating the impurities and to collect them in a special slag. A copper litharger was used for leaching. A copper melt was left containing the precious metals. The cast anodes were then submitted to an electrorefining-process. The efficiency of the recovery of the precious metals in the whole process could be raised to 90%.
R.J.F.

N84-24802# Birmingham Univ. (England). Dept. of Physical Metallurgy and Science of Materials.

EFFECT OF PREFERRED ORIENTATION ON CRACK GROWTH PROPERTIES OF Ti-6Al-4V ALLOYS, PART 1 Final Report
D. S. Jasim, C. J. Beevers, and W. B. Hutchinson Sep. 1981 138 p refs 2 Vol.
(Contract MOD-AT-2027/016/MAT)
(BR89100-Pt-1) Avail: NTIS HC A03/MF A01

Fatigue tests were carried out on specimens machined from a heavily textured plate of Ti-6Al-4V. The specimens had the six principal orientations ST, SL, LS, TS, TL and LT and the crack growth was monitored by the dc potential drop method. A highly orientation sensitive fatigue response was observed; the highest threshold level in LT was about twice the lowest threshold in ST. This anisotropic behavior was rationalized in terms of the anisotropy of slip activity at the crack tip when the reverse plasticity is contained within individual grains, with a superimposed effect of mechanical fibering due to the alignment of the microstructure in the rolling direction. This latter effect was largely significant in ST and SL orientations where fatigue crack growth was predominantly along the planar alpha/beta boundaries. R.J.F.

N84-24642*# Societe Nationale Industrielle Aerospatiale, Cannes (France).
MICROWELDING OF VARIOUS METALLIC MATERIALS UNDER ULTRAVACUUM (A0138-10)
Jean Pierre Assie *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 35-37 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11F

N84-24680*# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France).
THIN METAL FILM AND MULTILAYERS EXPERIMENT (A01-38-3)
J. P. Delaboudiniere and J. M. Berset *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 159-160 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11F

N84-24839# Universidade Estadual de Campinas (Brazil). Dept. of Mechanical Engineering.
PURIFICATION OF METALS BY ZONE MELTING. AN OPTIMIZATION Abstract Only
R. Bertazzoli and A. Garcia *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 9-10 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/6

N84-24841# Universidade Estadual de Campinas (Brazil). Dept. of Mechanical Engineering.
GRAIN REFINEMENT OF COMMERCIAL ALUMINUM BY NIOBIUM AND ZIRCONIUM ADDITIONS TO THE MELT Abstract Only
M. H. Robert and N. L. Cupini *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 12-13 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/6

N84-24842# Ottawa Univ. (Ontario). Dept. of Mechanical Engineering.
A UNITED FRACTURE KINETICS REPRESENTATION OF THE THREE REGIONS OF STRESS CORROSION CRACKING Abstract Only
A. S. Krausz and K. Krausz *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 14 Previously announced as A84-19817 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/6

N84-25060*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
STATUS OF UNDERSTANDING FOR BEARING MATERIALS
E. N. Bamberger *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 773-794 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11F

N84-25410# Middle East Technical Univ., Ankara (Turkey). Faculty of Engineering.
THE EFFECT OF LOADING RATE AND TEMPERATURE ON FRACTURE INITIATION TOUGHNESS IN A LOW STRENGTH STEEL
Rafet Arikan (Gazi Univ.) and Mustafa Doruk *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 183-207 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-24803 Defence Research Information Centre, Orpington (England).
METHODS OF FULL AND ACCURATE RHEOLOGICAL CHARACTERISATION
R. Koopman Jan. 1984 35 p refs Transl. into ENGLISH of Kautschuk undd Gummi (West Germany), Vol. 36, no. 2, 1983 p 108-109
(AD-B080747; DRIC-T-7133; BR90770) Copyright. Avail: Issuing activity

The development of a simple and accurate method of rheological characterization that can be used in the quality control of rubber production is described. The method tests the raw polymer rather than the polymer mix, which makes the test more accurate and repeatable. The sample size required for the test is also smaller than that required from the polymer mix. R.J.F.

N84-24804# Aeronautical Research Labs., Melbourne (Australia).
WEATHERING TRIALS AND NEW RIGIDITY TESTS ON PROTECTIVE HELMETS FOR MOTOR CYCLISTS
S. R. Sarralhe 1984 36 p refs
(ARL-STRUC-TECH-MEMO-372; AR-002-998) Avail: NTIS HC A03/MF A01

Protective helmets with fiberglass or polycarbonate shells were exposed to the weather for three years and subjected to conventional and new rigidity tests. These indicated that: (1) exposure did not cause deterioration in performance; (2) there was a serious imbalance between the rigidity of the shell and the hardness of the liner; (3) some current standards encourage selection of a grade of 'shock absorbing' liner that is too hard relative to the rigidity of the shell. Review of the standards is proposed. Author

N84-24805*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHENOXY RESINS CONTAINING PENDENT ETHYNYL GROUPS AND CURED RESINS THEREFROM Patent Application
Paul M. Hergenrother, inventor (to NASA) Filed 10 May 1984 17 p
(NASA-Case-LAR-13262-1; US-Patent-Appl-SN-608741) Avail: NTIS HC A02/MF A01 CSCL 11C

Phenoxy resins containing pendent ethynyl groups, the process for preparing the same, and the cured resin products obtained therefrom, are discussed. Upon the application of heat, the ethynyl groups react to provide branching and crosslinking. The cure temperature can be lowered by using a catalyst, but this step is not required. The cured phenoxy resins containing pendent ethynyl groups have improved solvent resistance and higher use temperature than linear uncrosslinked phenoxy resins. These improved thermoplastics are applicable for use as coatings, films, adhesives, composited matrices, and molding compounds. NASA

N84-24806*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSELY REFLECTING PAINTS INCLUDING POLYTETRAFLUORETHYLENE AND METHOD OF MANUFACTURE Patent Application
Michael C. Shai and John B. Schutt, inventors (to NASA) Filed 26 Apr. 1984 11 p
(NASA-Case-GSC-12883-1; US-Patent-Appl-SN-604337) Avail: NTIS HC A02/MF A01 CSCL 11C

A highly diffuse, reflective paint is described which is comprised of an alcohol soluble binder, polytetrafluoroethylene (TFE) and an alcohol for coating a substrate and forms an optical reference with a superior Lambertian characteristic. A method for making the paint by first mixing the binder and alcohol, and thereafter by mixing in outgassed TFE is presented. A wetting agent may be employed to aid the mixing process. NASA

N84-24807*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COATED FLEXIBLE LAMINATE AND METHOD OF ITS PRODUCTION Patent Application
John J. Park, inventor (to NASA) Filed 2 May 1984 9 p
(NASA-Case-GSC-12913-1; US-Patent-Appl-SN-606430) Avail: NTIS HC A02/MF A01 CSCL 11B

The use of silicone as a protective coating on Kapton (trademark), a polyimide film, is described. Because of its flexibility, Kapton is considered the material best suited for use in fabrication of large, rollable, and foldable solar cells needed for spacecraft. Silicone adhesive coatings protect the emissivity and absorptivity characteristics of a Kapton layer solar array so that they change less than 0.01%, even when subjected to a high concentration of oxygen atoms in a space atmosphere. A method of applying the silicone coating is also described. R.S.F.

N84-24808*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW WEAR PARTIALLY FLUORINATED POLYIMIDES
Robert L. Fusaro and William F. Hady 1984 30 p refs To be presented at the Joint Lubrication Conf., San Diego, Calif., 22-24 Oct. 1984
(NASA-TM-83629; E-2066; NAS 1.15:83629) Avail: NTIS HC A03/MF A01 CSCL 11H

Tribological studies were conducted on five different polyimide solid bodies formulated from the diamine 2,2-bis [4-(4-aminophenoxy)phenyl] hexafluoropropane (4-BDAF) and the dianhydrides pyromellitic acid (PMDS) and benzophenonetetracarboxylic acid (BTDA). The following polyimides were evaluated 4-BDAF/PMDA, 4-BDAF/BTDA, 4-BDAF/80 mole percent PMDA, 20 mole percent BTDA, 4-BDAF/60 mole percent BTDA. Friction coefficients, polyimide wear rates, polyimide surface morphology and transfer films were evaluated at sliding speeds of 0.31 to 11.6 m/s and at temperatures of 25 C to 300 C. The results indicate that the tribological properties are highly dependent on the composition of the polyimide and on the experimental conditions. Two polyimides were found which produced very low wear rates but very high friction coefficients (greater than 0.85) under ambient conditions. They offer considerable potential for high traction types of application such as brakes. Author

N84-24809*# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
THE IMPACT RESISTANCE OF SiC AND OTHER MECHANICAL PROPERTIES OF SiC AND Si3N4 Final Report
Richard C. Bradt Apr. 1984 47 p refs
(Grant NsG-3016)
(NASA-CR-165325; NAS 1.26:165325) Avail: NTIS HC A03/MF A01 CSCL 11G

Studies focused on the impact and mechanical behavior of SiC and Si3N4 at high temperatures are summarized. Instrumented Charpy impact testing is analyzed by a compliance method and related to strength; slow crack growth is related to processing, and creep is discussed. The transient nature of flaw populations during oxidation under load is emphasized for both SiC and Si3N4. Author

N84-24810*# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
AN INVESTIGATION INTO THE INJECTION MOLDING OF PMR-15 POLYIMIDE Final Report
Mario A. Colaluca Jun. 1984 32 p refs
(Grant NAG3-129)
(NASA-CR-173550; NAS 1.26:173550) Avail: NTIS HC A03/MF A01 CSCL 11G

The chemorheological behavior of the PRM-15 molding compounds were characterized, the range of suitable processing parameters for injection molding in a reciprocating screw injection molding machine was determined, and the effects of the injection molding processing parameters on the mechanical properties of molded PMR-15 parts were studied. The apparatus and procedures for measuring viscosity and for determining the physical response of the material during heating are described. Results show that capillary rheometry can be effectively used with thermosets if the equipment is designed to overcome some of the inherent problems of these materials. A uniform temperature was provided in the barrel by using a circulating hot oil system. Standard capillary rheometry methods can provide the dependence of thermoset apparent viscosity on shear rate, temperature, and time. Process conditions resulting in complete imidization should be carefully defined. Specification of controlled oven temperature is inadequate and can result in incomplete imidization. For completely imidized PMR-15 heat at 15 C/min melt flow without gas evolution occurs in the temperature range of 325 C to 400 C. A.R.H.

N84-24811# Baumgarten (Heinrich), Neunkirchen (West Germany).
RECYCLING OF DUROPLASTIC MOULDING MATERIALS HARDENED BY DISPERSION BY MEANS OF POWDERING AND COMPOUNDING NEW MATERIALS Final Report, Mar. 1981
Michael Oppermann Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 12 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-302; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 2,50

Hardened duroplastic recrements were powered in a two-stage operating grinding machine. The ground stock as final product had to show a grain size of 0.8 mm max. Together with new material, the reclaimed product was pressed to standard rocks under different proportions of ingredients, of 10%, 15%, and 18%, and was checked according to DIN 7708. Other tests conducted did not reveal any essential divergence of the physical characteristics to the rods from mixed material. Injection molding tests were also carried out with mixed material, of which the proportions of ingredients compiled with the conditions of the injection molding material, tools and SG-machine. The compound share of the reclaimed product was between 12% and 22%. The apportioning and blending was undertaken directly on the processing machine. Author

N84-24812# Motoren- und Turbinen-Union Muenchen G.m.b.H. (West Germany).
DEVELOPMENT OF HIGH TEMPERATURE CERAMIC PARTS FOR VEHICULAR GAS TURBINES Final Report, May 1980
Werner Huether and Wolfgang Krueger Bonn Bundesministerium fuer Forschung und Technologie Jan. 1984 70 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-006; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

In the second three-years program, ceramic components for a truck gas turbine were designed and tested. A combustion chamber variant of SiC + Si survived a running time of 22.3 hours without damage under pressure conditions with cyclic load. The inlet cone

of fabricated design remained free of cracks in all test runs. Stator varieties were tested under atmospheric conditions at 1650 K. No damage occurred in stator segments. Integral stators had cracked shrouds. Tests under operation pressure are being prepared. The turbine disc concept - metallic disc with set-in ceramic blades - of the first ceramic program was modified following a reconsideration of construction data. HPSN blade dummies have survived 5000 load cycles from 0 to 465m/s circumferential speed with reference to the blade central cross section (construction datum 387 m/s) without damage in the cold spin test. Blades of HPSN and RBSN were tested in the hot spin test (maximum gas temperature 1470 K). Material characteristics were established for the ceramic sorts - HPSN, RBSN, SiC + C - used at present. Methods for processing the ceramics were further developed. Main features were ultrasonic countersinking and shape-grinding. Author

N84-24813# Office of Naval Research, London (England).
EUROPEAN RESEARCH ON POLYMERS AND COMPOSITES
R. W. Armstrong and V. T. Stannett 13 Feb. 1984 12 p
(AD-A139760; ONRL-R-5-84) Avail: NTIS HC A02/MF A01 CSCL 11/4

This report discusses the strategies and funding for research on polymers and composites in the UK, the Federal Republic of Germany, and France. Author (GRA)

N84-24814# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
COMBUSTION OF AMMONIUM PERCHLORATE-POLYMER SANDWICHES Annual Report, Aug. 1982 - Oct. 1983
E. W. Price, J. K. Sambamurthi, R. R. Panyam, and R. K. Sigman Feb. 1984 82 p
(Contract N00014-79-C-0764)
(AD-A139873) Avail: NTIS HC A05/MF A01 CSCL 21/2

A summary of results of experimental studies of combustion of AP-polymer sandwiches is reported. Most recent results are combined with those of a previous report, and mechanistic interpretations are presented. On the basis of these interpretations, a detailed qualitative model of the combustion zone structure is advanced, and examined for consistency with results of this and other studies. The results are tested by prediction of a singular feature of the burning of propellants, and propellant tests are reported that confirm the predictions. The results indicate that the combustion of AP-hydrocarbon binder propellants involves closely coupled, three-dimensional interactions among several regions of the flame complex. These features are important to understanding both steady state and oscillatory combustion. Author (GRA)

N84-24815# Virginia Polytechnic Inst. and State Univ., Blacksburg.
SURFACE AND BULK PHASE SEPARATIONS IN BLOCK COPOLYMERS AND THEIR BLENDS Interim Report, 30 Sep. 1982 - 30 Dec. 1983
N. M. Patel and D. W. Dwight Mar. 1984 137 p
(Contracts N00014-82-K-0185; DAAG29-80-K-0093)
(AD-A140020; VPI-E-84-7) Avail: NTIS HC A07/MF A01 CSCL 11/9

Surface and bulk properties have been studied in terms of composition and morphology of siloxane containing block copolymers and their blends with homopolymers. X-ray Photoelectron Spectroscopy (XPS) has been used to obtain the compositional information from the top 60 Angstroms or so at the surface. Transmission Electron Microscopy (TEM) was utilized to probe the bulk morphology. An attempt is made to compare the bulk and the surface and find possible mechanisms governing them. It is found that solvent-cast neat block copolymers have a uniform layer at the surface that is rich in siloxane whereas their bulk has a microphase-separated domain structure. In case of blends, siloxane enrichment is quite pronounced even at bulk concentrations as low as 0.05% w/w siloxane. Amount of surface siloxane as a function of bulk content is studied with the help of XPS. At the same time, the bulk morphology of these blends is studied by TEM. The changes occurring in the surface and the bulk are found to have similar patterns. GRA

N84-24816# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain). Tecnica Aeroespacial.
DEVELOPMENT OF CAPSULAR ADHESIVE SYSTEMS AND EVALUATION OF THEIR STABILITY Final Scientific Report, 15 Jul. 1982 - 15 Sep. 1983
O. R. Murillo 10 Nov. 1983 84 p
(Grant AF-AFOSR-0316-82; AF Proj. 2301)
(AD-A140083; EOARD-TR-84-11-2) Avail: NTIS HC A05/MF A01 CSCL 11/1

Studies on microencapsulation of adhesive systems have been conducted. Encapsulation trials have been carried out on anaerobic adhesives and epoxy resins. The resulting total capsular anaerobic adhesives were characterized. A capsular epoxy adhesive formulation was developed to form a 'one can' dry, free flowing granulate, heat curable. The epoxy capsules and the capsular adhesive are characterized. Comparative adhesion tests were performed with the encapsulated systems with regard to the original unencapsulated compositions. GRA

N84-24817# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
SOLUTIONS IN SYNTHETIC AND BIOLOGICAL POLYMERS
A. R. Bishop 1983 22 p refs Presented at the Intern. Conf. on Nonlinear Electrodyn. in Biological Systems, Loma Linda, Calif., 5-9 Jun. 1983
(Contract W-7405-eng-36)
(DE84-007505; LA-UR-84-429; CONF-830697-4) Avail: NTIS HC A02/MF A01

Solid state and statistical physics applications of soliton mathematics continue to expand rapidly. The present report describes connections between solid state (e.g., synthetic polymer) and biophysics, with strong nonlinearity playing the unifying role. Striking parallels examined include: analytical (as in the case of self trapping mechanisms); numerical techniques; experimental implications, applications, and techniques. Conventional solid state probes are at last being devoted to biopolymers but their complexity is demanding new extremes and techniques. DOE

N84-24818# Matrecon, Inc., Oakland, Calif.
PERMEABILITY OF POLYMETRIC MEMBRANE LINING MATERIALS
H. E. Haxo, Jr., J. A. Miedema, and N. A. Nelson 1984 10 p refs
(Contract EPA-68-03-2969)
(PB84-166859; EPA-600/D-84-080) Avail: NTIS HC A02/MF A01 CSCL 07D

Permeabilities to three gases (carbon dioxide, methane, and nitrogen), water vapor, and five solvents (methanol, acetone, cyclohexane, xylene, and chloroform) are reported for a broad range of commercial polymeric membranes. Gas and water vapor transmission (WVT) data were determined by ASTM methods and solvent vapor transmission data were obtained in a modified WVT procedure. Permeability characteristics of thermoplastic and partially crystalline membranes were also assessed in pouch-type tests with salt solutions, actual wastes, acetone, xylene, and water-soluble and organic-soluble dyes. All membranes were permeable to some extent. Magnitude and direction of fluid transport vary with the membrane composition and its thickness, temperature, the permeant fluid, and the driving force which depends upon the concentration or the vapor pressure gradient across the membrane. Permeability depends upon the solubility and diffusion characteristics of the permeant in the particular membrane. Author (GRA)

N84-24819# Texas Technological Univ., Lubbock. Inst. for Disaster Research.
NONLINEAR ANALYSIS OF RECTANGULAR GLASS PLATES BY GALERKIN METHOD Final Report
C. V. G. Vallabhan and F. Y. Ku Jun. 1983 81 p refs
(Grant NSF CEE-81-18214)
(PB84-159649; TTU/IDR-69D) Avail: NTIS HC A05/MF A01 CSCL 11B

Theoretical stress analysis of window glass plates under lateral

pressure becomes complex. The plates are thin and undergo large deformations, even under small pressures. The plate equations become geometrically nonlinear; these nonlinear equations are difficult to solve, even with the aid of computers. At this time there are no exact closed form solutions for these nonlinear plate equations. Extensive efforts have been conducted at Texas Tech University and elsewhere in the past five years to extend the understanding of window glass behavior under lateral pressure. The finite element and finite difference methods were applied to the problem. Both of these methods are discrete, numerical techniques. In this report, the writers use a Galerkin approach to solve the nonlinear glass plate equation for rectangular plates undergoing large lateral deflection. GRA

N84-24635*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATOMIC-OXYGEN STIMULATED OUTGASSING (A0034)
Robert L. Scott, Jr. (Southern Univ.) and Roger C. Linton *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 11-13 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

N84-24646*# Texas A&M Univ., College Station.
BALLOON MATERIALS DEGRADATION (S1006)
David H. Allen *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 49-51 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

N84-24647*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
THERMAL CONTROL COATINGS EXPERIMENT (A0138-6)
A. Paillous and J. C. Guilaumon (CNES) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 52-53 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

N84-24648*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPOSURE OF SPACECRAFT COATINGS (S0010)
Wayne S. Slemp *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 54-56 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

N84-24649*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THERMAL CONTROL SURFACE EXPERIMENT (S0069)
Donald R. Wilkes and Harry M. King *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 57-61 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

N84-24650*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ION-BEAM-TEXTURED AND COATED SURFACES EXPERIMENT (S1003)
Michael J. Mirtich, Jr. *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 62-65 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11G

N84-24685*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EFFECTS OF SOLAR RADIATION ON GLASSES
Ronald L. Nichols and Donald L. Kinser (Vanderbilt Univ.) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 170-172 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 11B

N84-24846# Drexel Univ., Philadelphia, Pa.
EFFECTS OF CURING STRESS ON INTRALAMINAR CRACKING IN GRAPHITE-EPOXY LAMINATES Abstract Only
A. S. D. Wang *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 33 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/7

N84-25055*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS AND NEW DIRECTIONS FOR SOLID LUBRICANT COATINGS AND COMPOSITE MATERIALS
Harold E. Sliney *In its* Tribology in the 80's, vol. 2 Apr. 1984 p 665-680 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11H

N84-25056*# Hohman Plating and Mfg., Inc., Dayton, Ohio.
PRACTICAL APPLICATIONS AND USES OF SOLID LUBRICANT FILMS
Bernard C. Stupp *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 681-702 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11H

N84-25057*# Dow Corning G. m. b. H., Munich (West Germany).
SUPPORT OF OIL LUBRICATION BY BONDED COATINGS
Ruediger Holinski *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 709-721 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11H

N84-25412# Middle East Technical Univ., Ankara (Turkey). Dept. of Metallugical Engineering.
SELECTION OF A MINERAL-BASE LUBRICANT FOR THE COLD ROLLING OF ALUMINUM STRIP
Turgay Ertuerk, Tuerker Guerkan, Zuehtue Uysal, and Ali Riza Tekin *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 209-217 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-24820# Research Inst. of National Defence, Stockholm (Sweden).
AGING CONTROL NUMBER 4 OF GAS GENERATOR GRAINS FOR RB 05 AND RB 24
Anders Schwartz Jan. 1984 18 p refs In SWEDISH; ENGLISH summary
(FOA-C-20528-D1(D3); ISSN-0347-3694) Avail: NTIS HC A02/MF A01

Gas generators for two missiles, RB 05 and RB 24, were tested on aging properties. Stabilizer content in RB 24 gas generators decreased, but seems to be enough for another 15-17 years. The values of adhesion of inhibitor on the grains as a function of age fall on the same curve as before and show a decrease with time. The adhesion seems to reach a constant level after about 15 years. Exceptions among the measured grains seem to be grains made in 1972 for RB 05 which show higher values than 'normal'. R.J.F.

N84-24821# Ballistic Research Labs., Aberdeen Proving Ground, Md. Ballistic Research Lab.
A NUMERICAL STUDY OF SHOCK INITIATION OF COMPOSITION-b BY HIGH-SPEED IMPACT OF SMALL STEEL PROJECTILES Final Report
Y. K. Huang, J. J. Starkenberg, and A. L. Arbuckle Aberdeen Proving Ground, Md. Army Armament Research and Development Command Feb. 1984 41 p
(DA Proj. 1L1-61102-AH-43)
(AD-A139629; AD-F300396; ARBRL-TR-02548) Avail: NTIS HC A03/MF A01 CSCL 19/4

Using the SIN and 2DE computer codes, we have conducted a numerical study of the shock initiation response of both bare and covered composition-B charges to projectile impact. In the bare charge case we observed two modes of shock initiation. Independence of the explosive response with respect to projectile aspect ratio was verified and critical conditions were determined as a function of projectile diameter with unit aspect ratio. The critical velocity was observed to have a linear dependence on the reciprocal of the square root of the diameter with values a little below experimental data. Additional linear relations to completely describe buildup to detonation were generated from the results. We found that development of detonation is similar in the case of covered charges. When the critical velocity was corrected for cover plate thickness, good agreement between the results for bare and covered charges was observed. GRA

N84-24822# Air Force Engineering and Services Center, Tyndall AFB, Fla.
DEGRADATION OF JET FUEL HYDROCARBONS BY AQUATIC MICROBIAL COMMUNITIES Interim Report, 23 Oct. 1981 - 30 Sep. 1983
J. C. Spain, C. C. Somerville, L. C. Butler, T. J. Lee, and A. W. Bourquin Nov. 1983 226 p
(AF Proj. 1900)
(AD-A139791; AFESC/ESL-TR-83-26) Avail: NTIS HC A11/MF A01 CSCL 21/4

A model fuel mixture of fifteen hydrocarbons representative of those in distillate jet fuels was used to determine whether degradation by natural microbial communities could affect the persistence of such fuels released into aquatic environments. The mixture included hexane, cyclohexane, n-heptane, methylcyclohexane, toluene, n-octane, ethylcyclohexane, p-xylene, cumene, 1,3,5-trimethylbenzene, indan, naphthalene, 2-methylnaphthalene, n-tetradecane, and 2,3-dimethylnaphthalene. The water-soluble fraction of the model fuel was incubated in shake flasks with water or water and sediment suspensions collected at estuarine and freshwater sites. Surface films of the model mixture were studied under quiescent incubation. The disappearance of hydrocarbons was measured by capillary gas chromatography. Control flasks were sterilized with HgCl to estimate losses due to abiotic processes. Fate tests were repeated with petroleum-derived JP-4. The soluble components of JP-4 were volatilized too rapidly for biodegradation to occur. Sedimentation dramatically affected the fate of fuel components when mixing of the hydrocarbon and sediment layers was studied. Sediment-associated components were more resistant to volatilization and microbial attack. GRA

N84-24823# United Technologies Corp., San Jose, Calif. Chemical Systems Div.
SOLID PROPELLANT NONLINEAR CONSTITUTIVE THEORY EXTENSION Final Report, Sep. 1980 - Aug. 1983
E. C. Francis, C. H. Carlton, R. Thompson, W. M. Fisher, and W. L. Hufferd Edwards AFB, Calif. Air Force Rocket Propulsion Lab. Jan. 1984 336 p
(Contract F04611-80-C-0052; AF Proj. 2307)
(AD-A139957; UTC/CSD-2742; AFRPL-TR-83-071) Avail: NTIS HC A15/MF A01 CSCL 21/9

This report includes the Phase 1 preliminary study in which the Quinlan theory was critiqued, alternate approaches were studied and detailed research planning accomplished. Also included are detailed experimental evaluations of propellant during Phases 2 and 3, the uniaxial/isothermal investigation and the two-dimensional variable temperature investigation. The report also covers the validation of the accuracy of the constitutive theory in a three-dimensional state of stress and strain. Detailed subcontractor theoretical development and predictions are given. GRA

N84-24824# Naval Postgraduate School, Monterey, Calif.
ELECTRICAL SPRAY MODIFICATION WITH VARIOUS FUELS IN A t56 COMBUSTOR
A. Zajdman Mar. 1984 74 p
(AD-A139961; NPS67-83-003CR) Avail: NTIS HC A04/MF A01 CSCL 21/4

The possibility of electrically altering the droplet size distribution and injection cone angle of gas turbine fuel injectors has been investigated. The work was carried out both in a combustor rig incorporating a T-56 combustor liner/nozzle and in a non-burning spray optical absorption apparatus into each of which a high voltage electrode could be introduced. Several electrode designs were investigated in an effort to minimize flameholding and subsequent electrical shot circuiting. Fuels investigated included JP-4, the design fuel, JET-A, JP-5, and Diesel Fuel Number 2. Results of the optical experiments indicated reductions in the Sauter Mean Diameter of 7.7 percent. Results of the combustion experiments indicated increases in combustor efficiency of up to 3.6 percent for Diesel Fuel Number 2 and increases up to 0.6 percent for JP-4. Author (GRA)

N84-24825# Defence Research Establishment, Ottawa. (Ontario).
COMPARISON OF JFTOT (JET FUEL THERMAL OXIDATION TESTER) AND ABSORBANCE METHODS FOR DETERMINING JET FUEL THERMAL STABILITY
J. R. Coleman and L. D. Gallop Dec. 1983 26 p In ENGLISH and FRENCH
(AD-A138673; DREO-TN-83-34) Avail: NTIS HC A03/MF A01 CSCL 21/4

The thermal stability of five aviation turbine fuels was examined employing the jet fuel thermal oxidation tests and an optical absorbance based on the Phillips 5 ml bomb test. No correlation was observed between the fuels by the two methods. Author

N84-24826# California Univ., Livermore. Lawrence Livermore Lab. H Div.
H DIVISION MATERIALS PHYSICS Quarterly Report, Jul. - Sep. 1983
D. A. Young 24 Feb. 1984 71 p refs
(Contract W-7405-eng-48)
(DE84-007789; UCID-18574-83-3) Avail: NTIS HC A04/MF A01

H Division has been developing accurate statistical-mechanical models of explosive detonation products which combine molecular physics, accurate liquid theory and multicomponent chemical equilibria. This theory has been applied to the explosive PETN, and good agreement with experiment is obtained for the detonation velocity. Residual discrepancies between theory and experiment suggest that phase separation and chemical kinetics effects are significant. Line emission spectroscopy has proved very useful as a technique for determining the temperature and density of laboratory plasmas. Thorough analysis of these plasmas requires large codes which combine hydrodynamics, radiation transport and atomic physics. Because such codes are very complex and difficult to use, a fast, accurate atomic physics code has been developed which synthesizes K-shell spectra at arbitrary temperatures and densities. The code makes use of calculated populations of H-, He-, and Li-like states, then computes lineshapes, and combines these into a synthetic spectrum. The method has been applied to laser-produced and Z-pinch plasmas. The plasma temperatures and densities have been efficiently obtained by fitting the model spectrum to the experimental one. DOE

N84-24827# California Univ., Livermore. Lawrence Livermore Lab.
SIMULATION OF SHOCK-INDUCED ENERGY FLUX IN MOLECULAR SOLIDS, REVISION 1
Arnold M. Karo, Franklin E. Walker, Thomas M. DeBoni, and John R. Hardy (Nebraska Univ.) 27 Feb. 1984 17 p refs Presented

at the 9th Intern. Colloq. on Dyn. of Explosions and Reactive Systems, Poitier, France, 3-9 Jul. 1983
(Contract W-7405-eng-48)
(DE84-008331; UCRL-88760-Rev-1; CONF-830704-9-Rev-1) Avail: NTIS HC A02/MF A01

Computer molecular dynamics has been used to study the time evolution of the energy of diatomic molecules embedded in a monatomic host lattice when the system is shock loaded. Center of mass, rotational, and internal energies were each monitored. For H2 and CH groups in an iron host, the results demonstrate rapid and violent internal excitation of a totally athermal nature. The origins of this are discussed as are the reasons for the absence of a similar effect for a CH group in a carbon lattice. From these results for diatomic systems it is argued that large molecules, similarly treated, may easily be excited to the point of rupture. If they are so situated (e.g., at or near a surface) that during, or shortly after, excitation they escape from the lattice, they will rupture rather than de-excite and thus generate molecular fragments (e.g., free radicals) which could, in the case of an explosive system, serve to initiate detonation. DOE

N84-24828# Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
STUDY OF DEFLAGRATION-TO-DETONATION TRANSITION (DDT) IN THE GRANULAR EXPLOSIVE, CP
Melvin R. Baer, Eugene A. Igel, Jace W. Nunziato, and Robert J. Gross Feb. 1984 60 p refs
(Contract DE-AC04-76DP-00789)
(DE84-009500; SAND-83-1929) Avail: NTIS HC A04/MF A01

Combustion processes associated with deflagration to detonation transition in the granular explosive, CP were studied. Image enhanced, high speed streak photography recorded the various stages of flame spread within heavily confined charges as viewed through a lexan window in a thick wall, stainless steel tube. A multiphase reactive flow model based on the theory of mixtures describes the observations. This nonequilibrium model treats each phase as fully compressible and incorporates a compaction model for the granular reactant. Formulation of the constitutive models includes a pressure dependent burn rate and experimentally determined porous bed permeability. DOE

N84-24733# National Research Council of Canada, Ottawa (Ontario). Fuels and Lubricants Lab.
AVIATION FUEL SPECIFICATION REQUIREMENTS: THEIR SIGNIFICANCE AND FUTURE TRENDS
L. Gardner and R. B. Whyte *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 15p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24734*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESEARCH ON AVIATION FUEL INSTABILITY
Charles E. Baker, David A. Bittker, Stephen M. Cohen, and Gary T. Seng *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 11p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01 CSCL 21B

N84-24735# United Technologies Corp., East Hartford, Conn.
ALTERNATIVE FUEL DEPOSIT FORMATION
J. TeVelde, L. J. Spadaccini, E. J. Szetela, and M. R. Glickstein (Pratt and Whitney Aircraft) *In* AGARD Combust. Probl. in Turbine Eng. Jan: 1984 10p refs (For primary document see N84-24732 15-25)
(Contract M00140-80-C-0097)
Avail: NTIS HC A19/MF A01

N84-24736# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
COMBUSTOR TECHNOLOGY FOR BROADENED-PROPERTIES FUELS
W. J. Dodds *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24739# Southwest Research Inst., San Antonio, Tex.
U.S. ARMY ALTERNATIVE GAS-TURBINE FUELS RESEARCH: MERADCOM
C. A. Moses *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24741# Avco Lycoming Div., Stratford, Conn. Advanced Combustor Design Dept.
ALTERNATIVE FUELS USE IN A VEHICULAR GAS TURBINE
Nicholas R. Marchionna *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 13p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24763# Illinois Univ., Urbana-Champaign. Dept. of Mechanical and Industrial Engineering.
PREDICTED TF41 PERFORMANCE WITH THE AGARD RESEARCH FUEL
J. E. Peters *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 8p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-24829 Societe Nationale Industrielle Aerospatiale, Saint-Medard-en-Jalles (France). Div. Systemes Balistiques et Spatiaux.
INDUSTRIAL APPLICATIONS FOR PLASMA TORCHES [APPLICATIONS INDUSTRIELLES DES TORCHES A PLASMA]
A. Allard 7 Nov. 1983 16 p In FRENCH
(SNIAS-832-430-101) Avail: NTIS HC A02/MF A01

The first generation plasma torch for industrial applications developed at Aerospatial has two coaxial tubular electrodes jointed by a chamber for turbulent gas injection. The design theory, basic principles, functions, servomechanisms, operations, and maintainability are listed. Drawings are included. Transl. by A.R.H.

N84-24830*# National Aeronautics and Space Administration. Pasadena Office, Calif.
RECIPROCATING MAGNETIC REFRIGERATOR EMPLOYING TANDEM POROUS MATRICES WITHIN A RECIPROCATING DISPLACER Patent Application
Dean L. Johnson, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 9 Mar. 1984 31 p
(Contract NAS7-100)
(NASA-Case-NPO-16257-1; US-Patent-Appl-SN-588164) Avail: NTIS HC A03/MF A01 CSCL 13H

A method and apparatus for a magnetic refrigeration system are described. A continuously reciprocating displacer houses at least a pair of paramagnetic substances each of which is alternately driven into and out of a magnetic field. Two separate bidirectional pumping systems flow helium gas through the displacer and through both paramagnetic substances to create heat exchange conditions at two separate temperature extremes. NASA

N84-24831# Research Inst. of National Defence, Stockholm (Sweden).
HAZARDOUS CONDITIONS IN SINGLE ENCLOSURES SUBJECTED TO FIRE
Bengt Haegglund Dec. 1983 26 p refs Sponsored by Swedish Fire Research Board
(FOA-C-20524-D6; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

Computer modeling was applied to predict the environmental conditions in single space enclosures resulting from growing fires.

The calculated times which occur when the critical events, smoke logging and flashover, in single enclosures are presented. The times when sprinklers and fire detectors operate are given for enclosures of various size and ventilation conditions. It is suggested that the results may be applicable to real fire scenarios in enclosures of various types and contents. The relative increase of risk to life and to property, in terms of shrinking time, when the doubling time of a fire decreases from 5 to 1 minute is shown.
E.A.K.

N84-24832# Bristol Univ. (England). Dept. of Aeronautical Engineering.
AN INVESTIGATION INTO THE SAND EROSION TECHNIQUE AS A MEANS OF DETERMINING THE WIND ENVIRONMENT AROUND BUILDINGS B.S. Thesis
G. R. Beaman and S. D. Shukla Jun. 1983 38 p refs
(BU-294) Avail: NTIS HC A03/MF A01

Due to the presence of the atmospheric boundary layer, the stagnation pressure on the windward face of a high building increases with height, resulting in a flow of air down the building creating regions of high wind speeds in close proximity to the building. An investigation was carried out into the feasibility of using a sand erosion technique to determine the wind environment at pedestrian height in building complexes. The technique was developed from an initial investigation carried out by Beranek and van Koten. The technique was found to be consistent within reasonable experimental limits and a contour line map of equal discomfort was obtained using this technique. It is easily adapted to define contours of varying discomfort: however, this was not done. The effects of initial sand thickness and duration of test upon the contours were obtained. Recommendations were made on how to develop the technique to be able to define areas of differing discomfort. Author

N84-24833# Delaware Univ., Newark.
ABSTRACTS OF THE 20TH ANNUAL MEETING: SOCIETY OF ENGINEERING SCIENCE, INCORPORATED Abstracts Only Final Report, 30 Apr. - 30 Sep. 1983
Minoru Taya, ed. 1983 345 p refs Meeting held in Newark, Del., 22-24 Aug. 1983
(Contract DAAG29-83-M-0258)
(AD-A138155; ARO-20222.1-EG-CF) Avail: NTIS HC A16/MF A01 CSCL 05/1

Special efforts were made to provide a spectrum of technical sessions balanced between topics in the thermal sciences, applied mechanics, materials science, and applied mathematics. Multiple sessions were organized on phase transitions, biomechanics, heat transfer, geomechanics, fracture mechanics, composite materials, and numerical methods. For individual titles, see N84-24834 through N84-24905.

N84-24834# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
NUMERICAL SIMULATION OF STRONGLY NON-ISOTHERMAL COMPRESSION MOLDING FLOWS Abstract Only
C.-C. Lee and C. L. Tucker, III *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 1-2 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

Compression molding is an important processing technique for polymers and composite materials. Usually, a thermosetting molding compound is squeezed between heated dies; the squeezing flow fills the mold, and heat from the mold initiates the curing reaction. There is considerable interest in simulating this process for non-trivial geometries for the purpose of optimizing the design and manufacture of parts. A two dimensional finite element model was first developed to investigate how the transverse viscosity gradient affects the velocity profiles. Using a three dimensional finite element model with stratified viscosities and an approximate flow front advancement scheme, the filling pattern was calculated for a rectangular charge. In order to know how severe the nonisothermality is in the real compression molding process, a conduction-convection heat transfer analysis was performed. The heat transfer analysis along with a relation between viscosity and temperature was then incorporated into the flow simulation to see how operating conditions affect the filling pattern. Author

N84-24835# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
HEAT FLOW, FLUID FLOW AND SOLIDIFICATION PHENOMENA IN WELD POOLS Abstract Only c37
Gregory Oreper and Julian Szekely *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 3-4 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

Through the simultaneous statement of the axisymmetric form of Maxwell's equations, the Navier-Stokes equations, and the differential thermal energy balance equation, a mathematical formulation was presented to describe the transient development of the fluid flow field, the temperature field and the melt - solid interface, in a liquid pool, generated by a spatially variable heat flux and current falling on a initially solid block. Full mathematical statement of the problem was developed. This physical situation is a somewhat idealized representation of the TIG welding process. In the formulation allowance made for the electromagnetic, buoyancy and surface tension forces and the resultant equations were solved numerically. Author

N84-24836# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
SIMULATION OF HEAT TRANSFER AND FLUID FLOW IN THE SOLIDIFICATION OF ALLOYS Abstract Only c34
Harold D. Brody and Robert A. Stoehr *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 5 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

Modeling of heat transfer and fluid flow in solidification processes applied to alloys was carried out to improve the understanding of the basic phenomena involved and to be used as design tools. Heat transfer analyses were carried out extensively. Fluid flow analyses were applied on a more limited scale. There are substantial opportunities to make contributions by developing fluid flow analyses of solidification processes. For the most part, analyses have not treated heat and fluid flow in a coupled manner. Both research and process design would be significantly advanced by development of practical analyses of coupled phenomena in alloy solidification. An important adjunct to developing analyses is determination of materials properties at high homologous temperatures for input to the mathematical (computer) models. Several examples are given of heat transfer and fluid flow models that were applied to practical solidification processes. Finite difference and finite element techniques were successfully applied to these complex problems. Underlying relations are discussed and indication was made of areas fertile for further analytical development.
Author

N84-24837# Illinois Univ., Urbana. Dept. of Mechanical Engineering.
FLUID FLOW IN LASER MELTED POOL Abstract Only c34
C. Chan, J. Mazumder, and M. M. Chen *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 6-7 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

The convective heat transfer and fluid flow are analyzed. Transient two dimensional model for surface tension driven fluid flow in laser melted pool is developed. The model describes the transient behavior of the heat transfer process of a stationary band source. Some semi-quantitative understanding of scanning is obtained by a coordinate transformation. Four dimensionless parameters arising from the general 3-D mathematical formulation are: Reynolds number (Re), Prandtl number (Pr), Surface tension number (S), and the melting temperature (T*melt). Each of these would govern the characteristics of the problem and each has its own physical interpretation. In the case of band source, Re and S are grouped into one parameter--their product. Numerical solution,

using the program SOLA is obtained for two different Prandtl number 0.1 and 0.02. Author

N84-24838# National Cheng Kung Univ., Tainan (Taiwan). Dept. of Mechanical Engineering.
FINITE ELEMENT ANALYSIS OF AXISYMMETRIC FORGING Abstract Only
C. I. Weng and C. T. Ho *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 8 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

The finite element method is used to analyze the forging problem of an axially symmetric body. The punching load as well as the distribution of pressure and strain rate are computed from the computer code. The validity of the code is verified by applying it to an ideally-plastic material with no friction between the die and material. Both the gross deformation rate and friction play a very important role in affecting the characteristics of forging. When the deformation rate is large, the nearly-rigid region is small, the strain rate is more uniform, and hence bulging is little. However, the punching load is increased as the flow stress is increased by increasing the strain rate of material. Punching load increases abruptly when the material flows and is in contact with the sidewall of die, and that the strain rate is low and the pressure is high in the flow-restricted regions. Author

N84-24839# Universidade Estadual de Campinas (Brazil). Dept. of Mechanical Engineering.
PURIFICATION OF METALS BY ZONE MELTING. AN OPTIMIZATION Abstract Only c26
R. Bertazzoli and A. Garcia *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 9-10 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/6

An experimental set-up, which permits controlled purification of metals by zone melting was developed. Some experiments were carried out with aluminum and antimony, where samples were submitted to different passes of the liquid zone. The resulting experimental concentration profiles were determined by atomic absorption spectroscopy and compared with theoretical predictions furnished by a multipass finite difference technique. Theoretical and experimental normalized concentration profiles show a good agreement. The number of passes necessary to attain the ultimate distribution were also calculated and are presented. Traditionally the zone melting process is carried out with constant rate of displacement of the liquid zone. Under this condition interface stability will be overestimated in some sections of the sample. A solid/liquid interface stability criterion which permits a maximum purification efficiency by varying the liquid zone speed with position along the sample is presented. Author

N84-24840# Alberta Research Council, Edmonton (Canada). Oil Sands Research Dept.
APPLICATION OF THE FINITE ELEMENT METHOD TO STUDY CRYSTAL GROWTH Abstract Only c76
Birbal Singh and Robert R. Gilpin (Alberta Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 11 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 05/1

The applicability of the finite element method to the study of crystal growth transport processes was investigated. The finite element method was chosen because a review of past analytical research in the area of crystal growth theory indicated that analytical techniques may have reached the limit of their usefulness and further progress in the area may require the exploitation of numerical methods. To demonstrate its applicability, the method was used to analyze the problems such as, the stability of cylindrical and spherical particles growing in supercooled liquid, dendritic growth, and the evolution of dendritic shape with time. Quantitative comparisons of the results obtained by this approach, other theories and experimental data indicate that the method is successfully used to study a variety of problems in the area of crystal growth. Author

N84-24841# Universidade Estadual de Campinas (Brazil). Dept. of Mechanical Engineering.
GRAIN REFINEMENT OF COMMERCIAL ALUMINUM BY NIOBIUM AND ZIRCONIUM ADDITIONS TO THE MELT Abstract Only c26
M. H. Robert and N. L. Cupini *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 12-13 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/6

Taking the peritectic theory as a reasonable one to explain the mechanism of grain refinement of Aluminum by Titanium additions, the efficiency of Niobium and Zirconium are investigated as grain refiners of Aluminum, since these elements also present peritectic reactions with liquid Aluminum, like Titanium does. For this purpose, Nb and Zr were added to liquid Al in different amounts and two different ways: master alloys and halogen salts of easy dissociation (K2NbF7, K2ZrF6). In order to comparate the effects with the traditional Ti, this element also was utilized, in the same conditions. Both methods of additions seemed to be adequate to introduce Nb and Zr to the liquid, the difference being the dimensions and distribution of remained NbAl3 and ZrAl3 particles in the resultant structure. In the case of master alloys inoculations, the particles are bigger and more aglomerate than in the salts inoculations case. Author

N84-24842# Ottawa Univ. (Ontario). Dept. of Mechanical Engineering.
A UNITED FRACTURE KINETICS REPRESENTATION OF THE THREE REGIONS OF STRESS CORROSION CRACKING Abstract Only c26
A. S. Krausz and K. Krausz *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 14 Previously announced as A84-19817 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/6

In order to obtain a description of the crack propagation velocity in stress corrosion cracking (SCC) that lends itself to test and design applications, a study was undertaken to regain the fundamental physical concepts of thermally activated processes and to derive from them the specific form of information appropriate for practical engineering. The starting point of the effort is the view of crack propagation as an atomic bond-breaking sequence. It is proposed that, for thermally activated SCC, the process can be described by a single expression over three regions. Author

N84-24843# Indian Inst. of Tech., Madras. Production Engineering Section.
SURFACE FATIGUE CHARACTERISTICS OF TRANSMISSION GEARS Abstract Only c37
R. Krishnamurthy and P. Natarajan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 15-16 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

Fatigue tests were carried out on spur gears in a recirculation power type test rig to understand the influence of hunting tooth, surface finish and surface treatment on fatigue characteristics. Involute recording, metallographic studies and Scanning electron microscopy were included. The study forms part to the tests being carried out for finding techniques to enhance the performance characteristics of even low/medium strength steel gears. Author

N84-24844# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
A MICROCHEMICAL DERIVATION OF THE DIFFERENTIAL EQUATIONS OF INTERFACIAL STATICS. 3: LINE TENSION Abstract Only c39
M. Adler and H. Brenner *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 17 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

A continnum mechanical theory of line-excess tension and adsorption is developed, quantitatively relating such phenomena directly to the density gradient intermolecular forces existing in the neighborhood of the three phase contact line. This purely mechanical (i.e., nonthermodynamic) theory is rigorously derived via singular perturbation methods, utilizing a small parameter expansion involving the ratio of the microscopic length scale over which the density gradient forces act to an appropriate macroscale associated with the macroscopic physical attributes (depth, interfacial curvature, lens radius, etc.) of the bulk phases. Slender-body theory serves as the geometrical basis of the perturbation scheme, with the body axis oriented along the contact line. In the sense of the theory of matched asymptotic expansions, the scheme automatically derives the proper pair of macroscopic boundary conditions at the common intersection of the phases, along the contact line. Author

N84-24845# McMaster Univ., Hamilton (Ontario). Dept. of Mechanical Engineering.
ON GEOMETRICAL ACCURACY IN PRECISE METAL FORMING Abstract Only
Nguyen L. Dung, C. Westerling (Hannover Univ.), and O. Mahrenholtz (Hannover Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 18 ref Sponsored in part by the Deutsche Forschungsgemeinschaft DFG (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

There are five main factors which influence the accuracy of the formed parts: raw piece, forming procedure, tool, forming machine and tribology. The material flow and behavior, the contact stresses, and the forming load during the forming processes are analyzed with the finite element method. This will allow the study of the mutual effect between tool and formed part, and from that the shape accuracy. The applied finite element method based on Markov's variational principle for rigid plastic material, includes the consideration of friction on the interface between tool and formed part. The friction affects the material flow and the material behavior due to the temperature rise on the interface. Numerical results are shown for forging processes. M.A.C.

N84-24846# Drexel Univ., Philadelphia, Pa.
EFFECTS OF CURING STRESS ON INTRALAMINAR CRACKING IN GRAPHITE-EPOXY LAMINATES Abstract Only **c27**
A. S. D. Wang *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 33 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/7

The effects of curing (thermal) stress on the formation mechanisms of intralaminar cracks in resin based composite laminates are investigated. The curing stress is caused primarily by the thermal cooling the laminate fabrication process. By itself, the residual curing stress may not cause sublaminate damage; but it can couple with mechanical stresses, when the laminate takes up external loads, so as to produce prematured internal failures. The analytical results are correlated with experiments in which a series of graphite epoxy laminates are tested under a wide range of temperature conditions. Although the thermal stress and the mechanical stress are additive, their effects on both crack initiation and propagation are coupled together in a quadratic form. The thermal coupling effect contribution to crack formation can be as much as 70%. M.A.C.

N84-24847# Illinois Univ., Urbana. Dept. of Theoretical and Applied Mechanics.
FATIGUE DAMAGE AND CRACK GROWTH IN RANDOM SHORT-FIBER REINFORCED COMPOSITES Abstract Only **c24**
S. S. Wang *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 34 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

A study on damage accumulation, cyclic degradation and crack growth in a random short fiber Sheet Molding Compound (SMC) composite subjected to fatigue loading is presented. Fatigue damage mechanisms in various forms of microcracking are examined. The transient nature of the nonlinear monotonic (or the first cycle) stress-strain behavior is investigated first. Subsequent property degradation and hysteresis dissipation are examined. Fatigue damage initiation and growth are homogeneous and isotropic in general. A parameter is introduced to define the degree of the homogeneous damage in the random short-fiber composites. A power law relationship among the rate of damage evolution, loading variables, and cyclic history is established. Nonhomogeneous damage in the form of macroscopic crack growth in the short-fiber composite is studied. A theoretical model is established to account for the interaction between homogeneous damage and nonhomogeneous crack growth. M.A.C.

N84-24848# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
A PROBABILISTIC THEORY FOR THE STRENGTH OF DISCONTINUOUS FIBRE COMPOSITES Abstract Only **c24**
Fuminori Hikami and Tsu-Wei Chou *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 35-36 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

A theoretical prediction of the strength of unidirectional fiber composites is performed based upon a probabilistic model of the fiber configuration. Emphases are placed on the effect of matrix stress transfer properties including matrix plasticity. For matrix deforming elastically, the strength as compared to rule of mixtures prediction for continuous fiber composites with identical fiber volume fraction, is reduced as the composite size increases. For matrix deforming plastically, the local stress concentrations are reduced. Based upon the analytical expression of local load shearing rule for plastic matrix, the composite strength is shown to approach the modified rule of mixture as the matrix yield stress decreases. M.A.C.

N84-24849# Texas Univ., Arlington. Dept. of Mechanical Engineering.
PLASTICITY OF LAMINATED COMPOSITES Abstract Only **c24**
S. Nomura *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 37-38 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

Plastic behavior of metal composite materials, especially layered composites is studied. Our objective here is work hardening phenomena of a layered composite material consisting of two different types of layers stacking either randomly or periodically are examined mathematically. A statistical approach is employed for the effective elastic modulus of short fiber composites. Each field quantity such as stress, strain, displacement, or elastic modulus is decomposed into a volumetric average part and a fluctuating part, and they are subsequently substituted into the stress equilibrium equation. This operation yields the partial differential equation with respect to the fluctuating displacement field that calls for the introducing of the elastic Green function. The solution for the local stress field was expressed by Neumann type infinite series. M.A.C.

N84-24850# Tel-Aviv Univ. (Israel). Dept. of Solid Mechanics, Materials and Structures.
THE EFFECTIVE BEHAVIOR OF INELASTIC COMPOSITES Abstract Only **c24**
Jacob Aboudi *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 39 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

The average behavior of unidirectional fiber reinforced composites, whose constitutents are anisotropic in the elastic region and viscoplastic in the inelastic region, is determined. Effective stress effective strain curves are presented for various types of loading. In the special case of perfectly elastic phases, the effective moduli of the composite are obtained. Several comparisons

between the effective behavior of the composite, as predicted by the present theory and by other analytical, numerical and experimental approaches, are given. M.A.C.

N84-24851# Kagawa Univ. (Japan). Dept. of Information Science.
RELIABILITY-BASED DESIGN PRINCIPLE OF COMPOSITE MATERIALS WITH FAILURE PROBABILITY AS A STATISTIC Abstract Only **c38**
Hiroshi Ishikawa, Toshio Tanimoto (Boshisha Univ.), and Hitoshi Kimura *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 40-41 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/4

The statistical modelling of the failure probability under service loading is examined in the sense that the failure probability can be evaluated only through the limited number of experimental data, which would vary from sample to sample. The reliability based design safe lives of composite materials is investigated. M.A.C.

N84-24852# Rutgers Univ., New Brunswick, N. J. Dept. of Mechanics and Materials Science.
EFFECTIVE ELASTIC MODULI OF AN ISOTROPIC, TWO-PHASE COMPOSITE Abstract Only **c24**
C. R. Chiang and G. J. Weng *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 42 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

A theoretical approach to determine the effective elastic moduli of an isotropic, two phase composite is presented. The overall elastic response of the composite is modeled by an assumed global physical system. The underlying principle of the present method combines the spirit of self consistent formulation and the concept of polarization stress and strain. In contrast to the classically adopted constant polarization stress in each phase, a nonuniform polarization field is assumed. The analysis was carried out for both traction and displacement prescribed processes. By consideration of strain energy of the composite and an optimization process, bounds and unique solutions for the effective moduli of the composite are obtained in terms of those of the constituent phases and their volume fractions. M.A.C.

N84-24853# Rutgers Univ., New Brunswick, N. J. Dept. of Mechanical and Aerospace Engineering.
DYNAMIC INSTABILITY OF SUDDENLY HEATED, THICK, COMPOSITE SHELLS Abstract Only **c39**
H. Ray and C. W. Bert (Oklahoma Univ., Norman) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 43 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

Parametric instability due to nonlinear energy exchange between the unstable axisymmetric mode and unstable flexural modes was first investigated for suddenly applied axisymmetric pressure loading. The thermal loading analog of this problem was investigated and later extended to the case of a laminated composite shell. Two additional effects of particular importance in the case of rapidly heated composite shells: (1) transverse shear deformation, using a thick shell generalization of the Sanders shell theory, and (2) damping action. Analyses of both the short term and long term responses are presented. The effects of various parameters on the shell response are presented in graphical form. M.A.C.

N84-24854# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
TRANSVERSE SHEAR EFFECTS IN BIMODULAR COMPOSITE LAMINATES Abstract Only **c39**
Charles W. Bert and Faramarz Gordaninejad *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 44-45 ref Previously announced as N84-10195 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

A closed form solution for the Timoshenko-type shear correction coefficient (K2) governing the deflection of bimodular composite laminates in cylindrical bending is presented. The bending stress distribution for a laminate constructed of bimodular materials (which have different elastic moduli in tension and compression) is used in the two dimensional equilibrium equation to obtain the transverse shear stress distribution. This shear stress distribution is used to obtain expressions for the shear correction coefficient (based on equivalent shear strain energy) and the maximum dimensionless transverse shear stress (Tau xz) max. Finally, the effects of the elastic constant ratios on the neutral surface location and shear correction coefficient for laminates consisting of either unimodular or bimodular materials are studied. GRA (IAA)

N84-24855# Lehigh Univ., Bethlehem, Pa.
LONGITUDINALLY STIFFENED COMPOSITE MULTI-LAYER CYLINDRICAL SHELLS (AND RINGS) UNDER INTERNAL PRESSURE Abstract Only **c39**
D. P. Updike and U. Yuceoglu (Florida International Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 46 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

In relatively long, multilayer, composite, circular cylindrical shells (and also in short rings) subjected to high internal pressure it is observed that individual shell layers may crack or fracture in longitudinal direction. These long cracks are primarily due to large hoop stresses in circumferential direction. An approximate analysis of the problem is presented. In a two layer composite cylindrical shell, the inner shell layer is assumed fractured completely across the thickness in longitudinal direction while the outer shell remains intact. The system of first order partial differential equations are solved by a numerical scheme. Numerical results for some practical problems are presented. Also the extension of the problem to more complicated problems such as fiber layer reinforced, multilayer, long cylindrical shells and short rings are discussed in detail. Further extension of the problem to nonlinear cases are considered. M.A.C.

N84-24856# Rochester Inst. of Tech., N. Y. Dept. of Mechanical Engineering.
ON SOME DYNAMIC PROBLEMS IN LAYERED ELASTIC-VISCOELASTIC BEAMS Abstract Only **c39**
Richard B. Hetnarski *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 47 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

Vibration modes of layered beams are studied. The beams under consideration consist of an elastic main (central) element, two viscoelastic layers (one on each side of the main element), and elastic outside layers which serve as constraining layers for the viscoelastic material. The purpose of inclusion of viscoelastic layers is to increase internal damping of vibrations of the layered beams compared with elastic beams. In the considered model, the main elastic element is assumed to exhibit no internal damping, with only normal stresses appearing in it. Viscoelastic layers are assumed to exhibit only shear stresses. As for the behavior of the outside (constraining) layers, two different approaches are considered: (1) it is assumed that the outside layers have zero normal strain during bending of the beam; (2) normal strain is allowed in the outside layers. GRA

N84-24857# Doshisha Univ., Kyoto (Japan). Dept. of Mechanical Engineering.
STATISTICAL FATIGUE AND RESIDUAL STRENGTH DEGRADATION MODEL FOR GLASS POLYESTER LAMINATES Abstract Only **c39**
Toshio Tanimoto and Hiroshi Ishikawa (Kagawa Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 48-49 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

A residual strength degradation model for composite materials

proposed based upon the assumption that the residual strength, as a random variable, decreases monotinically in exponential form with increasing number of stress cycles. An experimental test program on the plain woven glass cloth laminated FRP was conducted to generate statistical meaningful data. Fatigue tests were carried out under repeated tension and compression loadings. Then the tensile strength was measured to examine the change of properties in the material at a given fraction of the fatigue life. M.G.

N84-24858# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
EFFECT OF STRESS SINGULARITIES ON THE DELAMINATION OF LAMINATED COMPOSITES Abstract Only **c39**
F. Delale *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 50 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

The general problem of stress singularities occurring near the free edge of two bonded anisotropic materials is investigated. After formulating the problem of two bonded anisotropic wedges, the stress singularity near the free edge of two bonded layers, at the tip of a crack between two materials and in the vicinity of a broken layer is obtained by simply varying the wedge angles. It is shown that, the power of singularity depends on the elastic constants of the adjacent layers. Several examples occurring in real layered composites are studied in some detail. It is also shown that, unlike the isotropic case the power of singularity at the tip of a crack beween two materials can be real. M.G.

N84-24859# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
EFFECT OF INITIAL STRESSES ON THE IMPACT BEHAVIOR OF GRAPHITE-EPOXY LAMINATES Abstract Only **c39**
B. V. Sankar and C. T. Sun *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 51-52 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

Low velocity impact damage in graphite-epoxy laminates subjected to initial tensile stresses was investigated experimentally. Finite elements were employed to study the effect of initial stresses on the impact response. Contact force and bending strain histories were calculated with a plate finite element program. The numerical solution was compared with the experimental results. A two dimensional finite element which can account for the effects of initial stresses was also developed to evaluate the interlaminar stresses which are needed in developing an impact damage model. The results show that the laminate plate theories are sufficient to predict the contact force history and the bending stresses. But from the two dimensional analysis it is found that in the vicinity of the impact point, the maximum interlaminar shear stress does not occur at the center of the laminate, but at a point closer to the impact point. M.G.

N84-24860# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
LOW VELOCITY, TRANSVERSE NORMAL IMPACT OF A CLAMPED PLATE Abstract Only **c37**
L. W. Gause and Richard E. Llorens *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 53-54 Previously announced as N82-32430 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

A finite element solution which predicts the strains in clamped orthotropic plates which arise as a consequence of relatively low speed (0 to 30 m/s), hard object, transverse normal impact was developed. Previous analysis of impact on both beams and simply supported orthotropic plates showed that an undamped theoretical solution of the vibrating system, suitably corrected for damping, correlates available experimental data. This work extends those results to the analysis of the practically important problem of a clamped plate. Applying this analysis to impact tests on clamped thick plates which are representative of panels on naval aircraft, it was discovered that the correspondence between theory and experiment was quite good. Additionally, values of damping obtained for the present experiments coincide with the damping constants determined for simply supported plate tests. In the case of the thin plate series the correlation was not good. It appears that another physical mechanism is operative during the thin plate experimental investigation. Of the possible omissions, the effects of inplane stretching represent the most likely variable which is needed to improve the correlation. M.G.

N84-24861# Texas A&M Univ., College Station. Dept. of Aerospace Engineering.
RESONANT SCATTERING OF WAVES IN RANDOM PARTICULATE COMPOSITES Abstract Only **c24**
Vikram Kinra *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 55 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

Scattering of longitudinal waves in three different random particulate composites was studied experimentally: lead spheres/epoxy, glass spheres/epoxy, and steel spheres/PMMA. The phase velocity of longitudinal waves, and absorption were measured at low, medium and high frequencies. A wide range of volume fraction of inclusions was studied. At low frequencies the data were found to be very good agreement with static analyses. At high frequencies the results were found to be drastically different: the velocity takes a finite positive jump across a well defined cut-off frequency; and it appears to attain a frequency independent limit at high frequencies (optical limit). M.G.

N84-24862# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
IMPACT AND FATIGUE OF GRAPHITE/EPOXY LAMINATES Abstract Only **c39**
William G. Patterson and Minoru Taya *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 56 Previously announced as A84-22269 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

This paper is an experimental investigation of the effects of foreign object damage (FOD) on the tensile strength of graphite/epoxy laminates. Through the use of instrumented impact the energy plastically absorbed during impact was determined. The impact damage was also characterized from visual, C-scan, and SEM observations. Author (IAA)

N84-24863*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EFFECT OF MATRIX PROPERTIES AND FIBER PROPERTIES ON IMPACT FAILURE MECHANICS Abstract Only **c39**
W. Elber *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 57 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

The low-velocity impact problem in graphite/epoxy composite sheets must be solved before large amounts of that material can be used in commercial aircraft. Many of the low-velocity impacts that affect aircraft parts occur during normal ground operations and maintenance. Service equipment and tools have masses above 1 kg, and at velocities of less than 3 m/s can impact structural parts with energies higher than composites can endure without degradation of stiffness or strength. Simple solutions were developed for large-mass, low-velocity impacts which can be modeled as quasi-static events. Static test data and impact data show that the fiber properties control the impact energy which can be absorbed before penetration. Matrix shear strength and peel resistance control the extent of delamination. Comparison of results from tough matrix and brittle matrix composites show that although tough matrices reduce the extent of delamination, they lead to more fiber damage in the contact area. M.G.

N84-24864# Villanova Univ., Pa. Dept. of Mechanical Engineering.

APPLICATION OF STRESS-GENERATED HEAT IN COMPOSITES TO THERMOGRAPHIC NDT Abstract Only c38
Philip V. McLaughlin, Jr. and Mukesh G. Mirchandani *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 58-59 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/4

The use of cyclic stressing of fiber composite materials as a means of generating detectable heat in flawed regions of composite structures for flaw detection purposes is evaluated. A combined analytical/experimental investigation was conducted which enables the viscoelastic heat generated in polymeric matrix composites to be predicted from applied peak loads and loading frequency. Energy dissipation rate density is used in conjunction with finite element stress analysis and finite difference heat transfer analysis of glass/ and graphite/epoxy laminates to predict the surface temperatures in the vicinity of flaws. Cyclic tension tests are conducted on these same laminates, and surface temperatures, are measured with an infrared camera. Good agreement is obtained between analysis and test. The heat generation analysis is then used to investigate the effects of stress amplitude and cyclic frequency upon surface temperatures of glass/epoxy and graphite/epoxy specimens. M.G.

N84-24865# Delaware Univ., Newark. Center for Composite Materials.
OBSERVATIONS ON THE FRACTURE OF FIBEROUS COMPOSITES Abstract Only c24
Bruce A. Yost and R. Byron Pipes *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 60 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

The fracture behavior of several composite material systems subjected to uniaxial tensile loads at ambient temperatures and containing through cracks 0.635 cm (0.250 in) to 2.54 cm (1.00 in) in length, was examined. The crack growth patterns and failure mode of each material system were recorded in a series of photographs and comparisons were made. Two distinct crack growth patterns and failure modes were observed, depending upon the orientation and length of the fibers. The noticed strength data indicate that each material system exhibits a region of notch insensitivity, beyond which notched strength decreases with increasing crack size. Moreover, the fracture behavior of one of the randomly oriented, short fiber systems was further examined at low temperatures, i.e., -73 C (-100 F) and -129 C (-200 F). These results indicate that the notch insensitivity of this particular material system increases with decreasing temperature. Several of these specimens exhibited both a tensile and a compressive failure mode. Author

N84-24866# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
AN INTEGRAL OPTICAL METHOD FOR DETERMINING STRESS INTENSITY FACTORS Abstract Only c39
C. W. Smith, J. S. Epstein, and O. Olaosebikan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 61 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

A method involving the use of frozen stress photoelasticity and high sensitivity Moire interferometry to obtain optical data at intervals along the border of real cracks grown under service load conditions is discussed. These data are then converted into independent stress intensity factor estimates through the use of simple algorithms. After briefly reviewing the method as it is currently applied, and delineating the restrictions and limitations of the method, some features pertaining to three dimensional continuum effects in near tip structural mechanics not previously measured are discussed. In particular, the region surrounding the point of right angle intersection of a crack with a free boundary is discussed in some detail. R.J.F.

N84-24867# Hercules Powder Co., Wilmington, Del.
ON THE ANALYSIS OF THICK WALLED COMPOSITE MATERIAL CYLINDRICAL SHELLS Abstract Only c24
T. L. Walts and J. R. Vinson (Delaware Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 62 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

Methods of analysis are developed for very thick cylindrical, specially orthotropic shells. In the radial direction, all dependent variables are placed in terms of Legendre polynomials, or closely related functions, which have desirable properties. The present theory is an elasticity theory solution, does not employ any shell theory assumptions, and is approximate only in that the infinite series of Legendre polynomials and the closely related functions are truncated. The theory is developed starting with the elasticity equations in a circular cylindrical coordinate system. All assumptions are given and discussed. Explicit solutions are given for axially symmetric problems, including a semi-infinite shell with transverse shear stresses acting along the edge; and a semi-infinite shell acted upon by axial in-plane edge stresses which are directly proportional vectorially to the distance from the shell middle surface (i.e., analagous to a stress couple). R.J.F.

N84-24868# Florida Univ., Gainesville. Dept. of Engineering Sciences.
CRACK-GROWTH RESISTANCE OF LAMINATED HYBRID COMPOSITES Abstract Only c24
S. K. Chaturvedi and C. T. Sun *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 63 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

The crack-growth behavior of hybrid composites having two different stacking sequences, namely: (C/1 1/2 R/C 1 1/2 R/C) and (R/C 1/2 R/C/1/2 R/C/R) to be designated here as material A and material B, respectively are characterized. The letter C in these hybrids represents a 50% weight fraction continuous fiber composite (glass-polyester) layer while the R represents a 50% weight fraction randomly oriented chopped fiber composite (glass-polyester) layer. The standard compact tension specimens having notches oriented along and perpendicular to the fiber direction of the C layers to be designated, respectively, as A-0, B-0, and A-90, B-90 with the a/w (notch length/specimen width) ratios as 0.3, 0.4, 0.5, 0.6 and 0.7 were chosen. The fracture-resistance of the specimens A-0 and B-0, for which a self-similar crack-growth was observed, was calculated using the K-calibration technique, and also the method that uses the load P sub max at which incipient crack-growth occurs. Based upon the numerical results, it is observed that the fracture resistance of A-0 and B-0 specimens is significantly greater than the pure 0-degree layered composite, but only relatively lower than the pure chopped fiber composite. This fracture resistance does not appear to be sensitive to the stacking sequency for these composites. For the A-90 and B-90 specimens the fracture resistance (the flexural strength) is found to be close to their transverse tensile strengths. R.J.F.

N84-24869# Columbia Univ., New York. Dept. of Mechanical Engineering.
THE CONCEPTUAL DESIGN OF MECHANISMS AND MECHANICAL SYSTEMS Abstract Only c37
Ferdinand Freudenstein *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 64-65 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/9

The computer aided design of mechanisms and mechanical systems is discussed. Kinematic structure and its relation to creative design, as well as the abstract representation of the kinematic structure of mechanisms in terms of linear graphs in which vertices correspond to links and kinematic pairs to labeled edges are discussed. A systematic method for the creation of mechanisms according to the separation of structure and function is discussed. R.J.F.

N84-24870# Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics.
AUTOMATED DYNAMIC ANALYSIS OF MECHANISMS WITH FLEXIBLE LINKS Abstract Only **c37**
Burton Paul *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 66 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

The development of analytical and numerical methods for the dynamics and kinematics of linkage machinery--methods which are suitable for automatic formulation and solution of the differential equations of motion are discussed. The methods proposed use a set of redundant coordinates termed Lagrangian coordinates as well as the classical (independent) generalized coordinates. The Lagrangian coordinates are shown to be especially well suited to problems involving closed loops of links, and make it extremely convenient for users to pose constraint relationships of a most general type--both holonomic and nonholonomic. In addition, the topology of the vector network inherent in any linkage mechanism is exploited to find the equations of constraint due to loop closure, in a systematic readily programmable procedure. Examples are given of how computerized simulation proceeds for systems with rigid links. R.J.F.

N84-24871# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
A DESIGNER'S PERCEPTION OF COMPUTER-AIDED DESIGN Abstract Only **c61**
Warren P. Seering *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 67 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 09/2

Computer Aided Design is an area which is receiving a great deal of attention currently. Yet in most cases, work being done could more correctly be categorized as computer aided analysis or computer aided drafting. And for these applications, existing systems are very valuable. But existing hardware and software systems are generally not set up to be of great value to the conceptual designer. This task will center on the needs of the mechanical designer and on the configuration of several computer aided design systems proposed by the author to more effectively meet these needs. A brief history of computer aided design in the United States is followed by a discussion of current trends and of possible alternatives. Author

N84-24872# Rutgers Univ., Newark, N. J. Dept. of Mechanical and Aerospace Engineering.
OPTIMIZATION OF HIGH SPEED LINKAGES Abstract Only **c37**
Ting W. Lee *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 68-69 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

An analytical and computer aided procedure on the optimum design of linkages for high speed operation is given. The subject is treated in two parts. Part 1 concerns the development of an optimality criterion on the dynamic balancing of linkages, involving an analytical formulation using both the Lagrangian as well as the Newtonian approach. The major emphasis is on the development of a criterion which is capable of providing for a tradeoff on the minimization among various quantities such as input torque, force and moment, as well as being efficient in its numerical evaluation. In Part 2, a unit computer package for the design of high speed linkage is described. The effects of the design parameters on the linkage performance are then investigated and design guidelines are presented. The computational procedure involves the utilization of an effective optimization algorithm, namely the HOT code (Heuristic Optimization Technique of Lee and Freudenstein (1)), on the minimization of an objective function involving the dynamic balancing criterion. R.J.F.

N84-24873# George Washington Univ., Washington, D.C.
KINSYN AND MICRO KINSYN: USER-FRIENDLY COMPUTER SYSTEMS FOR LINKAGE DESIGN Abstract Only **c61**
Roger E. Kaufman and Murali Raju Dandu (Kintech, Inc.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 70-71 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 09/2

Micro KINSYN, a hardware/software system for the synthesis and analysis of linkage mechanisms is discussed. It allows one to quickly and easily design four bar linkages capable of exactly meeting specified performance requirements. One of the main features of Micro KINSYN is its 'user friendly' dialogue. The system is almost self teaching. It allows a user with little or no specialized training in either kinematics or computers to quickly and effectively design mechanisms using sophisticated kinematic theories. Due to the specialized hardware developed for Micro KINSYN, communication with the machine takes place by a natural, graphical dialogue. Control dials light up to prompt the user when they can be used and mnemonic menus prompt the user when typed input is required. On-line help is always available, simply by typing 'H' at the keyboard. The dialogue has been carefully structured to utilize the strengths of the available hardware while recognizing its limitations. While most of this system is coded in PASCAL, a large section needed to be implemented in hardware in order to achieve the necessary power and speed in a microcomputer based system. The overall system includes an Apple **, a printer, two disk drives, a specialized Micro KINSYN circuit board that plugs into the Apple, a Micro KINSYN control box that connects to this circuit board, and the necessary software on floppy diskettes. Much of Micro KINSYN is coded in assembly language and burned into eproms on the special circuit board. R.J.F.

N84-24874# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
DYNAMIC STABILITY OF HIGH ORDER LINEAR SYSTEMS Abstract Only **c66**
Maurice I. Young *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 72 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 12/2

The dynamic stability of a linear system with a large number of degrees of freedom can be examined effectively by considering the influence of the many system parameters on the purely imaginary eigenvalues of the 2Nth order dynamic matrix D is identical with B(-1)A, given the matrix differential equation A dot x + Bx = 0, where x = bar xe(lambda +) and D bar x = lambda(-1) bar x. This approach quickly yields the boundary of system dynamic stability as an explicit function of the systems parameters, provided the system characteristic equation can be determined for the boundary case when lambda = j omega where j2 = -1. This can be done in a straightforward manner employing the principal minor determinants of D2. A detailed numerical example of the procedure is presented which illustrates the calculation of critical parameter values and the frequency of oscillation at the stability boundary. An approximative method for rapid estimates of stability is also discussed. This employs the principal minor determinants of first and second order only. R.J.F.

N84-24875# Texas Univ., Austin. Dept. of Engineering Mechanics.
SURVIVAL PROBABILITY OF NON-LINEAR OSCILLATORS SUBJECTED TO BROAD-BAND RANDOM DISTURBANCES Abstract Only **c38**
P. D. Spanos *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 73 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/4

A method is presented for determining the survival probability of the response amplitude of a class of lightly damped nonlinear oscillators which are subjected to a stationary broad band random disturbance. The method is based on modeling the response amplitude by a Markovian process. This modeling leads to a backward Kolmogorov equation which is satisfied by the survival probability. For the case of a linear oscillator, the solution of this

equation was determined in the literature by using the technique of separation of variables. This technique leads to a boundary value problem, the eigenfunctions of which are a set of orthogonal confluent hypergeometric functions. The orthogonality of this particular class of hypergeometric functions and the availability of the associated eigenvalues, is the basis of developing approximate methods of solving the backward Kolmogorov equation which governs the survival probability of the nonlinear oscillators. Specifically, formulae for application of the Galerkin technique and of a perturbation technique are developed. R.J.F.

N84-24876# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
CONSERVATION LAWS FOR SOME SEPARABLE GYROSCOPIC DYNAMICAL SYSTEMS Abstract Only c35
Leon Y. Baher and Harry G. Kwatny *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 74 refs Previously announced as A83-50125 Submitted for publication (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/2

Features of a two dimensional gyroscopic system were analyzed by a coordinate transformation in which the explicit time dependence occurs only in the matrix coefficient of the new coordinates. The separability property leads in an uncoupling of the equations of motion in the transformed coordinates. The properties of the physical system in the uncoupled coordinate space are studied. It is shown that Foucault pendulum coordinate transformation needs to uncouple the problem is the rotation of axes. The response to arbitrary initial conditions and the conservation laws are derived in the uncoupled coordinate space. By reverting to the original coordinate space, the dynamical invariants are rederived and their physical bases are established. E.A.K.

N84-24877# Pennsylvania State Univ., University Park.
OPTIMAL DESIGN OF ROTATING DISK WITH TEMPERATURE GRADIENT Abstract Only c35
L. W. Hu and X. C. Pan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 75-76 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/2

The best profile for a rotating disk under operating conditions with stress field of desired characteristics is outlined. The profile design is a problem of optimization with multiple variables. An optimization scheme was developed on the basis of Zheng's Method ir. search for the global minimum. The thickness of the disk at a number of points along the radius of the disk as variables is assumed and a procedure for design is established to minimize a merit function which is formulated by incorporating the desired characteristics of the stress field with specified bounds on the thickness of the disk. A dead rim load which minimizes the shear stress at the outer boundary and keeps the normal stress as low as possible, the optimal profile is obtained. It is shown that an optimal profile of rotating disk with temperature gradients for design specifications can be obtained. E.A.K.

N84-24878# Kentucky Univ., Lexington. Dept. of Engineering Mechanics.
NONLINEAR VIBRATIONS OF A RUBBER SUPPORT SYSTEM CONSTRAINED BY A FIXED SURFACE Abstract Only c39
Millard F. Beatty *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 77 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

The finite amplitude, free nonlinear oscillation of a mass attached to a neo-Hookean, rubber spring support and constrained to move on a smooth plane surface was solved. The solution is obtained for both compression and suspension supports in beta and lambda functions. The periodic times for all cases are derived in Heuman lambda function. The physical conclusions are described graphically. E.A.K.

N84-24879# State Univ. of New York, Buffalo. Dept. of Mechanical and Aerospace Engineering.
CRITICALLY DAMPED DYNAMIC SYSTEMS Abstract Only
D. J. Inman and I. Orabi *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 78 refs (For primary document see N84-24833 15-39)
Avail: NTIS HC A16/MF A01 CSCL 20/11

The single degree of freedom concept of critical damping was extended to lumped parameter systems with n-degrees of freedom. The definitions were compared and a new method of calculating the critical damping condition were derived. The method insures that each mode is critically damped. The computational savings results do not require the calculation of eigenvectors or derivatives as the other methods do. A four degree of freedom example is given to indicate the effectiveness of the result. The systems considered are modeled by the vector differential equation. E.A.K.

N84-24880# Union Coll., Schenectady, N.Y. Dept. of Civil Engineering.
AN EXPRESSION OF STRAIN ENERGY INVOLVING COUPLE STRESSES IN SOLIDS Abstract Only c39
Surinder E. Lakhanpal *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 81-82 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

The strain energy expression which is important in the study of material is discussed. The expression with couple stresses included was developed. The theory of elasticity describes analytically the nature of the displacements and the corresponding stress field in a continuous elastic body subjected to known forces. In a perfectly elastic body the deformations disappear when the forces are removed. The theory is simplified to a great extent when only small deformations are considered and assumed to produce no rigid motion of the system. The theory, based on small deformations, is required for the development of the energy expression. The energy absorbed in a body is the strain energy. If the body behaves elastically and the small amount of energy lost in the form of heat is ignored, the strain energy can be recovered when the body is returned to its original position. E.A.K.

N84-24881# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
PRESSURE INDUCED RADIAL DIFFUSION OF A FLUID THROUGH A THICK WALLED HIGHLY ELASTIC CYLINDER Abstract Only c34
A. S. Wineman, M. Gandhi, and D. R. Rajagopal (Pittsburgh Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 83 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

Radial diffusion of a fluid through a highly elastic thick walled cylinder due to pressure differences at the inner and outer surfaces was considered. The interaction between the fluid diffusion and large solid deformation is accounted for by formulating the problem in the context of the theory of mixtures. The equation for the partial stresses and diffusive body force incorporate an expression for the specific internal energy function is suggested by the kinetic theory of rubber elasticity. Specification of the boundary condition for such a problem is resolved by a relation between surface traction and deformation when the mixture is in a saturated state. A radial mass flux pressure difference relation and the influence of axial stretch on this relation are presented. E.A.K.

N84-24882# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
HELICAL SHEAR OF AN ELASTIC CIRCULAR TUBE WITH NON-CONVEX STORED ENERGY Abstract Only c39
R. L. Fosdick and G. P. MacSithigh (Missouri Univ., Rolla) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 84 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

Helical shear for a tube composed of a homogeneous, isotropic, incompressible, finitely elastic material was considered. The subcase of circumferential twist for a material whose stored energy

function is nonconvex is studied. The full helical shear problem for such a material is analyzed. E.A.K.

N84-24883# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
STRESSES IN AND AROUND DOUBLE CONFOCAL SPHEROIDS EMBEDDED IN INFINITE MEDIA Abstract Only c39
Yozo Mikata and Minoru Taya *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 85 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

In order to solve the state of stress in a coated short fiber composite, the coated short fiber was modelled as double concentric spheroids embedded in infinite elastic media. When the composite system is subjected to uniform temperature rise T, the residual thermal stress is induced in and around the coating zone. The residual stresses in and around the coated short fiber was computed to the possibility of the circumferencial cracks in the coating zone. The method is based on the classical three function approach in the three domains, the fiber, coating zone and infinite media. E.A.K.

N84-24884# Maine Univ., Orono. Dept. of Mechanical Engineering.
APPROXIMATIONS FOR ELASTIC LAYERS AND A THREE-DIMENSIONAL ELASTICITY SOLUTION FOR A SIMPLY SUPPORTED RECTANGULAR PLATE Abstract Only c39
Mark Levinson *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 86-87 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

Two classes of problems for elastic layers, for thick plates and for foundations, were treated separately. It is shown that both may be treated in a unified manner. A theory of thick elastic plates is given which accounts for transverse normal stresses and strains as well as transverse shear deformations with warping while providing a generalization of the Vlasov-Jones foundation model which allows for displacements in planes parallel to the foundation surface. E.A.K.

N84-24885# Sargent and Lundy, Engineers, Chicago, Ill.
INTEGRATED ANALYSIS AND DESIGN FOR MULTI-LEVEL PERFORMANCE CRITERIA c39
Mir M. Ali *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1984 p 95-96 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

Interaction between analysis and design of structures when the designer designs a structure for service and ultimate load conditions is discussed. Structural analysis is concerned with the equilibrium and compatibility of a structure with selected member sizes based on a preliminary design. The member forces and deformations are presented. In structural analyse the mathematical equations of equilibrium and compatibility cannot be modified. Structural design is aimed at obtaining a structure that is safe, serviceable, reliable and economical. The designer exercises direct control on the choice of his design. The difficulty for the designer to combine analysis and design into a single integrated scheme is outlined. E.A.K.

N84-24886# Lehigh Univ., Bethlehem, Pa.
THE STATUS OF THE SIMPLE FLUID Abstract Only c34
R. S. Rivlin *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 103-105 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

The formulation of constitutive equations for materials with memory was discussed. It was assumed that the Cauchy stress g(t) is a functional of the history of the deformation gradient matrix. It is suggested that the superposition on the assumed deformation of a time-dependent rigid rotation merely rotates the stress by the amount of this rotation at time t. A different procedure which can break down in certain cases in which such constraints exist was applied. In the further restrictions which can be imposed on the form of the functional F by material symmetry were discussed. If (s) is the group of transformations describing the material symmetry, then F must satisfy the relation for all S in the group (s). No distinction was made between solids and fluids. Simple materials and simple fluids are defined. Author

N84-24887# Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
GRAVITATIONAL INSTABILITY OF AN INTERFACE BETWEEN TWO SECOND-ORDER FLUIDS Abstract Only c34
David F. McTique *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 109 (For primary document see N84-24833 15-31)
(Contract DE-AC04-76DP-00789)
Avail: NTIS HC A16/MF A01 CSCL 20/4

The stability of an interface between two halfspaces of contrasting second-order fluids was examined through a perturbation scheme for small nonlinear stress terms and disturbances of small slope. The leading order problem is that for two linear fluids, a well-known result is retrieved. It is found that the rate of growth or damping periodic disturbances is independent of wavelength. This result can be anticipated simply by noting that the only parameters appearing in this problem with no imposed geometric length scale are the driving force and the linear viscosity from which no length scale can be constructed. The correction due to the nonlinear stress terms, however, leads to quite a different result. It is shown that a critical wavelength of order lambda exists, for which the instability is a maximum. The critical wavelength is such that the linear viscous problem must be carried out to second order in the interface slope. A.R.H.

N84-24888# Tennessee Univ., Knoxville. Dept. of Engineering Science and Mechanics.
A TENSOR CONSTITUTIVE EQUATION FOR TURBULENT FLOW Abstract Only c34
A. J. Baker *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 110-111 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

A tensor constitutive relationship for the Reynolds stress tensor R(ij) involving components of mean flow strain rates is established, and his analyses confirm existence at "sufficient distances from boundaries in space and time". Results are given for three dimensional, steady, turbulent flowfield distributions in geometric configurations wherein the mean flow is essentially unidirectional, i.e., predominantly parallel to one (curvilinear) coordinate direction. A.R.H.

N84-24889# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
TURBULENCE EFFECT ON LAMINAR SEPARATION ON A CIRCULAR CYLINDER Abstract Only c34
Willy Z. Sadeh, Daniel B. Saharon, and Peter P. Sullivan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 112-113 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

A smooth circular cylinder in crossflow at subcritical Reynolds numbers was studied. Results show that the interaction of incident turbulence with the initial laminar boundary layer modifies the characteristics of the mean surface pressure distribution, delays the separation and reduces the drag. These changes exhibited a distinct dependence upon the Reynolds number-background turbulence combination and result, from the energizing of the initial laminar boundary layer by penetrating turbulence concentrated at scales commensurate with its thickness. Energy-containing eddies form a coherent substructure near the cylinder stagnation zone which ensures a continual supply of turbulent momentum and energy to the boundary layer. The incident turbulence-boundary layer interaction mechanism is supported by correlations among characteristics of the mean surface pressure distribution

and the position of the separation point with a turbulence intensity parameter and a turbulent separation parameter. A.R.H.

N84-24890# Pittsburgh Univ., Pa. Dept. of Mechanical Engineering.
FLOW BETWEEN ROTATING DISKS. PART 1: BASIC FLOW Abstract Only c34
S. J. Schneider, F. Labbe, H. N. Kaufman, and A. Z. Szeri *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 114-116 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

Multiplicity of basic flows, when the fluid is bounded by two infinite disks, reported by several investigators is examined with emphasis on whether, and under what conditions infinite disk flows approximate to laboratory flows between two finite disks. Laser Doppler velocity measurements were obtained in water between finite rotating disks, with and without through flow. Angular velocity ratios were studied for: (1) one disk rotating and the other stationary; (2) co-rotating disks of equal angular velocity; and (3) counter rotating disks of equal but opposite angular velocity. It is concluded that limiting flows are unique and are independent of flow history. With one disk rotating and the other stationary, the mid-radius limiting flow is recognized as the Batchelor profile of infinite disk theory. Other profiles, predicted by this theory to coexist with the Batchelor profile were neither observed experimentally nor were they calculated numerically by the finite disk solution obtained with a Galerkin, b-spline formulation. A.R.H.

N84-24891# Pittsburgh Univ., Pa. Dept. of Mechanical Engineering.
FLOW BETWEEN ROTATING DISKS. PART 2: STABILITY Abstract Only c34
A. Giron, S. J. Schneider, H. N. Kaufman, and A. Z. Szeri *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 117-119 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

Which, if any, of the multiple solutions of infinite parallel disk flows might be realizable in the laboratory was investigated. Finite disk flows were analyzed. Results show that the flow is least stable at the edge of the disk and near the center of rotation. A.R.H.

N84-24892# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
ON THE STRUCTURE OF ROTATIONAL INSTABILITIES IN NON-NEWTONIAN FLUIDS Abstract Only c34
Charles G. Speziale *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 120 refs Sponsored in part by the Exxon Education Foundation (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

The stability of an arbitrary base flow to large amplitude disturbances is examined from a theoretical standpoint for incompressible non-Newtonian fluids which are subjected to superimposed rigid body rotations. The non-inertial form of the full nonliner disturbance equations that arise from Cauchy's equations of motion are mathematically analyzed. For non-Newtonian fluids that satisfy the principle of material frame-indifference, it is proved that instabilities which depend on the state of rotation of a fluid must arise exclusively from variations in the velocity disturbances along the axis of rotation of the fluid. How these results are completely consistent with those obtained from the linear stability of rotating Newtonian fluids is demonstrated. Instabilities of the Taylor type in Couette flow and rotating plane Poiseuille flow are examined. The extensions of this analysis to the case of non-Newtonian fluids that violate material frame-indifference is also discussed. A.R.H.

N84-24893# Alabama Univ., University. Dept. of Engineering Mechanics.
FLOW AND FREE SURFACE OF A NON-NEWTONIAN FLUID BETWEEN CONCENTRIC CYLINDERS MAINTAINED AT UNEQUAL TEMPERATURES Abstract Only c34
Aydeniz Siginer *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 121-122 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

The motion and the shape of the free surface of a non-Newtonian liquid which fills the open space between two concentric cylinders maintained at different temperatures were analyzed. Under the effect of the temperature gradient the liquid circulates, driven by buoyant forces due to density variations and the free surface can not maintain its static shape. The analysis is set within the framework of Noll's concept of simple fluids. The motion is governed by the Oberbeck-Boussinesq equations. The non-linear problem is posed on a domain which must be determined as part of the solution. The Lagrangian theory of domain perturbations, which involves simultaneous perturbations of the field equations and the unknown flow domain, is used and the stress is assumed to be Frechet differentiable and expanded in a series in terms of the perturbation parameter, the temperature difference of the cylinder walls. The solution in the physical domain is represented as a power series, whose coefficients are the partial derivatives evaluated the rest state. A.R.H.

N84-24894# Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics.
NON-HERTZIAN ROLLING CONTACT WITH LONGITUDINAL CREEPAGE Abstract Only c37
B. Paul and S. Singh *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1984 p 138 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

Ideal rolling is not possible for deformable rolling bodies subjected to normal and tangential forces. In such bodies, relative slip will occur over an initially unknown subregion of the contact patch. This departure from ideal rolling is called creepage. When the applied tangential force is in the direction of rolling, the creepage is called longitudinal. A method is presented for solving the problem of longitudinal creepage for contact of rolling bodies of arbitrary (not necessarily elliposoidal) surface geometry. Such situations arise in practice with rails and wheels which are manufactured to have discontinuities in profile curvatures, or for closely fitting conformable contact, as in well-worn convex-concave contact. An analytical partial quadrature is used prior to discretization and applied to problems with conformable wheel rail profiles. A.R.H.

N84-24895*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELASTOHYDRODYNAMIC LUBRICATION OF SMOOTH SURFACES Abstract Only c37
Bernard J. Hamrock *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 141-142 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

Fully flooded, elastohydrodynamically lubricated contacts are considered. Elastohydrodynamic lubrication (EHL) analysis requires the simultaneous solution of the elastically, viscosity, density, and Reynolds equations. The most important practical aspect of elastohydrodynamic lubrication theory is the determination of the minimum film thickness within the conjunction. The maintenance of a fluid film of adequate magnitude is an essential feature of the correct operation of lubricated machine elements. The results show the influence of contact geometry on minimum film thickness as expressed by the ellipticity parameter and the dimensionless speed, load, and materials parameters. Film thickness equations are developed for materials of high elastic modulus, such as metal, and for materials of low elastic modulus, such as rubber. A.R.H.

N84-24896# Northwestern Univ., Evanston, Ill.
ELASTOHYDRODYNAMIC LUBRICATION OF ROUGH SURFACES Abstract Only c37
H. S. Cheng *In* Delaware Univ. Abstr. of the 20th Ann. Meeting,

Society of Engineering Science, Inc. 1983 p 143 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

The effect of surface roughness on elastohydrodynamic lubrication (EHL) is dependent on the ratio of the mean film thickness to the roughness height. When this ratio approaches or falls below three, the roughness effect becomes increasingly important. The mean film thickness in elastohydrodynamic contacts is shown to be strongly affected not only by the roughness height but also by the orientation of the asperity lays with respect to the flow. Lays in the direction of the flow, or longitudinally oriented roughness, tend to reduce the mean film thickness. For transversely oriented roughness with lays normal to the flow, the mean film thickness is improved. The mean lubricant pressure is also affected by the roughness height and asperity lay orientation. Surface roughness also produces local fluctuations of film thickness, pressure, and temperature at asperity contacts. Such phenomenon is known as micro-elastohydrodynamic lubrication. Micro-EHL can generate a minute film thickness which may be only in the order of 100 A but can be sufficient to give an adequate protection against sliding failure. A procedure is described for determining these micro-temperatures at the asperity contacts. A.R.H.

N84-24897# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
FRICTION IN ELASTOHYDRODYNAMIC CONTACTS Abstract Only **c37**
W. O. Winer *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 144-145 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

Friction in elastohydrodynamically lubricated contacts is examined. The resistance to motion in a highly loaded nonconformal lubricated contact (elastohydrodynamic or EHD contact) is referred to as friction if it is the result of solid friction between the asperities or as traction if it is the result of shearing a lubricant film. The contact is referred to as a mixed contact if both forms of resistance are present. A modified Maxwell model with a nonlinear viscous component has been introduced which incorporates three basic properties; each a function of temperature and pressure. The three properties can be measured in primary laboratory experiments independent of the elastohydrodynamic experiment and then employed in a constitutive equation in an analysis of the elastohydrodynamic contact to predict traction. B.W.

N84-24898# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURFACE TOPOGRAPHY-CONNECTIONS BETWEEN LUBRICATION AND FAILURE INITIATION Abstract Only **c37**
L. D. Wedeven *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 146-147 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

The characteristics of the initial surface topography is intimately connected to the machining process by which it is produced. Both processes create a near surface region of residual stresses, microstructure and hardness that is different from the bulk. The material properties in this rather undefined region can significantly influence the mode of failure, such as wear, scuffing or fatigue, as well as the degree of failure resistance for a given material. Under full film elastohydrodynamic (EHD) conditions, where shear is accomodated within a relatively thick lubricant film, the normal and shear stresses are distributed uniformly over the near surface region, and the surface topography has little influence on the lubrication or failure process. Under more typical conditions where surface roughness and lubricant film thickness are of the same order of magnitude, the surface topography not only emerges as an important parameter in failure initiation, but it also becomes intimately involved in the lubrication process itself. B.W.

N84-24899# California State Univ., Fresno.
STOCHASTIC SIMULATION OF CREEP BEHAVIOR Abstract Only **c39**
Chandra S. Brahma *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 174-175 Prepared in cooperation with Sverdrup and Parcel, Inc. (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

The deformation of granular media is studied from the point of view of the particulate structure. A granular soil is a random assembly of particles and a probability function is used to describe the number of contacts and their direction. Under a given stress increment, particle movements occur because of slips at the contacts. These considerations lead to the conclusion that the displacements at the contacts during deformational process can be treated by the methods of stochastic processes. Under the action of integranular forces in the granular mass, the particles move back and forth in a series of steps. Accordingly, a random work model has been postulated to describe the displacement behavior of particles. The differential equations, characterizing the transient phenomenon in the process, have been solved for appropriate boundary conditions and a strain-time relationship is derived for externally applied loading conditions. Author

N84-24900# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.
STUDIES OF ELASTIC-PLASTIC RESPONSE UNDER HIGH PRESSURE SHOCK LOADING Abstract Only **c39**
J. R. Asay *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 176 (For primary document see N84-24833 15-31)
(Contract DE-AC04-76DP-00789)
Avail: NTIS HC A16/MF A01 CSCL 20/11

A brief introduction to shock wave techniques is given. Results of recent shock wave studies conducted at Sandia National Laboratories on aluminum and other metals to shock pressures approaching 1 Mbar are discussed. This work has identified changes in the shear strength of shock-compressed metals which are not easily explained by conventional theories of elastic-plastic response. To develop an understanding of physical effects responsible for these observed changes in material properties, a wide variety of metallurgical studies were conducted on shock recovered specimens, including residual hardness, optical microscopy and TEM, X-ray diffraction and line broadening and positron annihilation measurements. These studies have identified correlations between the mechanical measurements of strength in the shocked state, and the defect state of recovered specimens. B.W.

N84-24901# Oxford Univ. (England). Dept. of Engineering Science.
TENSILE IMPACT TESTING OF FIBRE-REINFORCED COMPOSITES Abstract Only **c24**
J. Harding *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 178-179 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 11/4

Techniques which have been used to determine the mechanical properties of fiber-reinforced composite materials under tensile impact loading are briefly reviewed. The difficulties encountered in the design of a satisfactory tensile impact testing machine for composite materials are discussed and a new method, using a modified version of the standard tensile split Hopkinson's pressure bar (SHPB), is described. B.W.

N84-24902# Ballistic Research Labs., Aberdeen Proving Ground, Md.
RESPONSE OF STRUCTURAL PANELS TO AIR BLAST Abstract Only **c02**
Norris J. Huffington, Jr. and Henry L. Wisniewski *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1984 p 191 (For primary document see N84-24833 15-01)
Avail: NTIS HC A16/MF A01 CSCL 01A

A methodology suitable for predicting the damage inflicted

upon structural panels by blast from nearby high explosive detonations has been developed by extensive modifications of an existing finite-difference structural response code. A new constitutive formulation involving prescribed through-thickness stresses was introduced to account for the effects of intense surface pressures. This methodology was then applied to prediction of the response of a square panel of armor plate which was loaded by the blast from a spherical charge of high explosive detonated at a small distance from the midpoint of the panel. B.W.

N84-24903# Hawaii Univ., Honolulu. Dept. of Mechanical Engineering.
CONVECTIVE HEAT TRANSFER IN POROUS MEDIA Abstract Only c34
Ping Cheng *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 210-211 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

Recent emerging technologies on the extraction of geothermal energy, the design of insulation systems for energy conservation, the use of aquifers for hot-water storage, the disposal of nuclear wastes in sub-seabeds, the enhanced recovery of oils by thermal methods, and the design of catalyst-bed reactors have demanded an improved understanding of heat transfer mechanisms in fluid-filled porous media. Experiments have been conducted to investigate the onset of free convection in rectangular and cylindrical enclosures filled with porous media and heated from below. The Nusselt numbers determined from these experiments during steady conditions are correlated in terms of the Rayleigh number. The data for free convection in rectangular geometries show considerable scattering among investigators using different porous media and fluids. Recently, some data has been obtained for free convect on in water-filled glass beads adjacent to a heated vertical flat plate, a horizontal cylinder and between vertical concentric cylinders. The data obtained at low Rayleigh numbers is found to be in good agreement with theoretical predictions based on Darcy's law. B.W.

N84-24904# Tennessee Technological Univ., Cookeville. Dept. of Mechanical Engineering.
A PERTURBATION METHOD FOR SELF-COUPLED COMBUSTION-INSTABILITY PROBLEMS Abstract Only c25
Asghar Googerdy and John Peddieson, Jr. *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 241 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 21/2

A perturbation method for self-coupled combustion-instability problems is discussed. A model partial-differential equation is examined that arises in a simplified analysis of pressure-sensitive combustion instability in liquid-fuel rocket motors. It is shown that this method is capable of predicting all the features of previous numerical solutions and is useful in explaining them. B.W.

N84-24905# Pittsburgh Univ., Pa. Dept. of Mathematics and Statistics.
HIGH REYNOLDS NUMBER SOLUTIONS FOR INCOMPRESSIBLE VISCOUS FLOW USING THE REDUCED BASIS TECHNIQUE Abstract Only c34
Janet S. Peterson *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 249 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

The reduced basis technique is a reduction method which is based in the setting of a standard continuation method for nonlinear problems. The essence of the reduced basis technique is the selection of an approximating subspace which has properties which are intrinsic to the solution segment under consideration. In this study, standard finite element techniques are combined with the reduced basis method to obtain high Reynolds number solutions for incompressible viscous flows. In particular, the method is applied to the incompressible Navier-Stokes equations written in stream-function formulation. Numerical results for the model problem of a driven flow in a square cavity are presented and compared with results from other numerical treatments of the driven cavity problem. B.W.

N84-24906# Office of Naval Research, London (England).
THE 6TH INTERNATIONAL CONFERENCE ON COMPUTING METHODS IN APPLIED SCIENCES AND ENGINEERING
J. F. Blackburn 9 Feb. 1984 10 p Conf. held at Versailles, France, 12 - 16 Dec. 1983
(AD-A139824; ONRL-C-1-84) Avail: NTIS HC A02/MF A01 CSCL 05/2

The conference, held in December 1983, covered the following areas: structural and fluid mechanics, nonlinear analysis, oil reservoir simulations, compressible fluids, numerical algebra and software, semiconductors and hysteresis, multigrid methods, and parallel computing. Author (GRA)

N84-24907# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
FUEL-RESISTANT COATING AND BINDERS FOR POROUS FRICTION SURFACE PAVEMENTS: TESTS AND ANALYSES Final Report, May 1980 - Nov. 1983
J. S. Shoenberger Feb. 1984 66 p
(AF Proj. 2054)
(AD-A139865; AFESC/ESL-TR-83-33) Avail: NTIS HC A04/MF A01 CSCL 11/3

This report documents research to evaluate the ability of several products to render porous friction surfaces (PFS) resistant to damage from jet fuel and hydraulic fluid spillage. Test procedures and requirements used to select fuel-resistant binders and coatings for field trials are presented in detail. One field trial using one of the products found successful in the lab, Koppers RT14, was conducted with promising results. GRA

N84-24908# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
THERMODYNAMIC MODEL OF CREEP AT CONSTANT STRESSES AND CONSTANT STRAIN RATES
A. M. Fish Dec. 1983 26 p
(DA Proj. 4A7-62730-AT-42)
(AD-A139883; CRREL-83-33) Avail: NTIS HC A03/MF A01 CSCL 08/12

A thermodynamic model has been developed that for the first time describes the entire creep process, including primary, secondary, and tertiary creep, and failure for both constant stress (CS) tests (sigma = const.) and constant strain rate (CSR) tests (epsilon = const.), in the form of a unified constitutive equation and unified failure criteria. Deformation and failure are considered as a single thermoactivated process in which the dominant role belongs to the change of entropy. Failure occurs when the entropy change is zero. At that moment the strain rates in CS tests reach the minima and stress in CSR tests reaches the maximum (peak) values. Families of creep (epsilon vs t) and stress-strain (sigma vs epsilon) curves, obtained form uniaxial compression CS and CSR tests of frozen soil, respectively (both presented in dimensionless coordinates), are plotted as straight lines and are superposed, confirming the unity of the deformation and failure process and the validity of the model. A method is developed for determining the parameters of the model, so that creep deformation and the stress-strain relationship of ductile materials such as soils can be predicted based upon information obtained from either type of test. GRA

N84-24909# Florida Univ., Gainesville. Dept. of Civil Engineering.
CORROSION CONTROL FOR REINFORCED CONCRETE
R. M. Torigoe 1983 101 p
(AD-A139974) Avail: NTIS HC A06/MF A01 CSCL 11/2

The National Bureau of Standards has recorded that in 1975 the national cost of corrosion was estimated at $70 billion. Approximately 40% of that total was attributed to the corrosion of steel reinforcements in concrete. Though concrete is generally perceived as a permanent construction material, cracking and spalling can occur when corrosion of steel reinforcements

progresses to an advanced stage. This problem frequently occurs in reinforced concrete highway bridge decks, wharves, piers, and other structures in marine and snowbelt environments. Since concrete has a very low tensile strength, steel reinforcements are added to carry the tensile load of the composite member. Corrosion reduces the effective diameter of the reinforcements and, therefore, decreases the load carrying capability of the member. Though the corrosion process may occur in various forms and may be caused by different sources, the ultimate result is still the failure of the reinforced concrete. GRA

N84-24910# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INSTALLATION OF LARGE-SIZE TECHNOLOGICAL EQUIPMENT (SELECTED PAGES)
P. Y. Golovashchenko 7 Feb. 1984 101 p Transl. into ENGLISH from mono. "Montazh Krupnogabaritnogo Teknologicheskogo Oborudovaniya" Kiev, 1971 p 3-46
(AD-A139069; FTD-ID(RS)T-1331-83) Avail: NTIS HC A06/MF A01 CSCL 13/8

A general discussion is given on installing large-size manufacturing equipment in industrial plants. Machinery for automobile, steel, and cement plants is discussed. R.J.F.

N84-24911# National Bureau of Standards, Washington, D.C. National Engineering Lab.
PROCEEDINGS OF THE 12TH JOINT PANEL CONFERENCE OF THE US-JAPAN COOPERATIVE PROGRAM IN NATURAL RESOURCES: WIND AND SEISMIC EFFECTS
E. V. Leyendecker and R. M. Chung Jan. 1984 549 p refs Conf. held at Gaithersburg, Md., 19 - 23 May 1980
(PB84-167758; NBS-SP-665; LC-83-600593) Avail: NTIS HC A23/MF A01 CSCL 13M

The proceedings of the Joint Meeting include the program, the formal resolutions, the Task Committee Reports, and the technical papers. The subjects covered in the papers include: (1) the characterization of seismic ground motion, (2) the characterization of natural wind and extreme wind and extreme wind records, (3) structural response to earthquake loading, (4) storm surge and tsunamis, (5) recent developments in seismic design criteria, (6) technical cooperation with developing countries, (7) earthquake hazard mitigation, and (8) structural response to wind loading. GRA

N84-25600*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DETONATION-AND-FLAME ARRESTERS FOR GASOLINE-VAPOR RECOVERY SYSTEMS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 26-27
(For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 13I

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-24912 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
ESTIMATION OF CHANNEL CAPACITY OF THE TIME VARIABLE MULTIPATH CHANNEL
F. Schmitt May 1983 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeriums der Verteidigung
(Lfd-208; Rept-1-83) Copyright. Avail: Issuing Activity

The problem of determining the channel capacity for channels exhibiting time variable dispersion is discussed. It is shown that the capacity is always less than the Shannon capacity of nondispersive channels of equal bandwidth and equal S/N ratio. In the adaptive equalizing methods the time required for learning the impulse response of the channel is calculated as a function of the time constant of the channel and of the S/N ratio. E.A.K.

N84-24913 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
PATTERN DEFORMATION OF SCALAR ANTENNA ARRAYS DUE TO NEAR FIELD BACKSCATTER
O. Schmid and C. vonWinterfeld Sep. 1983 30 p refs In GERMAN; ENGLISH summary
(Contract BMVG-T-RF-37-A-0003-A-13003)
(Lfd-210; Rept-3-83) Copyright. Avail: Issuing Activity

Patterns of linear and circular scalar arrays are calculated for characteristic excitations in the presence of nearfield-scattering. A scalar version of geometrical theory of diffraction (scalar GTD) is used, and the ray-tracing problem is solved using a Runge-Kutta procedure. Author

N84-24914 Forschungsinstitut fuer Funk und Mathematik, Werthoven (West Germany).
TRANSMISSION LOSS CALCULATIONS FOR SYSTEMS WITH ANTENNAS CLOSE TO THE GROUND USING A DIGITAL DATA BASE
H. Kuschel Dec. 1983 42 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministeriums fuer Verteidigung
(Lfd-218; Rept-11-83) Copyright. Avail: Issuing Activity

Two propagation models which differ in the used terrain model are tested. In comparison with VHF measurements, these terrain-models are assessed according to their applicability to systems with antennas close to the ground. A terrain model is developed which is based on an evaluation of terrain specific parameters by means of a computer program from a topographic data base. M.A.C.

N84-24915 Defence Research Information Centre, Orpington (England).
DIGITAL VIDEO TRANSMISSION WITH REDUCED FRAME REPETITION RATE AND MOVEMENT-ADAPTED FRAME-TO-FRAME INTERPOLATION
V. Fink Nov. 1983 162 p refs Transl. into ENGLISH of "Digitale Videouebertragung mit Reduzierter Bildfolgefrequenz und Bewegungsangepasster Bild-zu-Bild-Interpolation" rept. DFVLR-IB-112-82/16 DFVLR, Brunswick, 20 Aug. 1982 In GERMAN and ENGLISH
(AD-B075822; DRIC-T-6898; BR88616) Copyright. Avail: Issuing Activity

The principle of movement compensating interpolation between transmitter frames is discussed and a practical, real time procedure was written in assembler and FORTRAN IV for a PDP-11/23 with RT-11 operating system. Full flow diagrams and source codes are given together with input/output procedure which involves direct memory access. E.A.K.

N84-24916 Royal Signals and Radar Establishment, Malvern (England). Automatic Speech Recording Section.
RSRE SPEECH DATA BASE RECORDINGS (1983). PART 1: SPECIFICATION OF VOCABULARY AND RECORDING PROCEDURE
J. Deacon, R. K. Moore, R. L. Pratt, M. J. Russell, and M. J. Tomlinson Dec. 1983 44 p refs
(AD-A139361; RSRE-83010-Pt-1; BR90735-Pt-1) Copyright. Avail: Issuing Activity

A data base of speech recordings which is currently made is described. The vocabulary which forms the basis of the data base can be conveniently divided into two parts. The first part is anglicized version of the Diagnostic Rhyme Test (DRT). This will be used for the assessment of speech communications equipment by subjective intelligibility tests, and for the evaluation of automatic speech recognition systems. The minimally contrasting pairs of rhyming words in the DRT in research which is directed towards the development of advanced speech recognition algorithms is used. The second part of the vocabulary consists of the 10 digits, the 26 letters of the alphabet and the 60 most frequent words in telephone conversation speech. E.A.K.

N84-24917# Royal Aircraft Establishment, Farnborough (England).
PREDICTION OF FIELD STRENGTHS NEAR HF TRANSMITTERS
J. M. Thomson, Elizabeth M. Davenport (British Aerospace, Bristol), and P. J. Frank Oct. 1982 23 p refs Presented at the IERE Electromagnetic Compatibility Conf., Southampton, England, Sep. 1980 Submitted for publication
(AD-B078278; RAE-TM-FS(F)-495; BR85848) Copyright. Avail: NTIS HC A02/MF A01

The types of antenna array commonly used in the UK in conjunction with high power HF transmitters and their principles of operation are outlined. Methods of predicting field strengths and power densities in both the near and far fields of such arrays are discussed. Particular reference is made to curtain arrays, log-periodic antennas, and rhombic arrays. Typical field strength patterns are illustrated for each type. An application is the prediction of the external radio frequency environment in which aircraft and flight weapons systems have to operate. Author

N84-24918*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Electrical Engineering and Applied Physics.
MILLIMETER WAVE TRANSMISSION SYSTEMS AND RELATED DEVICES Final Technical Report
Louis Michael Hebert 1984 119 p refs
(Grant NAG3-288)
(NASA-CR-173515; NAS 1.26:173515) Avail: NTIS HC A06/MF A01 CSCL 20N

A survey was made of the state-of-the-art in millimeter (20 GHz to 300 GHz) wave transmission systems and related devices. The survey includes summaries of analytical studies and theoretical results that were obtained for various transmission line structures. This material was supplemented by further analysis where appropriate. The transmission line structures are evaluated in terms of electrical performance, ease of manufacture, usefulness for building other devices and compatibility with solid state devices. Descriptions of waveguide transmission lines which have commonly been used in the microwave frequency range are provided along with special attention given to the problems that these guides face when their use is extended into the millimeter wave range. Also, guides which have been introduced specifically to satisfy the requirements of millimeter wave transmission are discussed in detail. Author

N84-24919# Japan Broadcasting Corp., Tokyo. Advanced Broadcasting Systems Research Div.
AN EXPERIMENTAL SYSTEM OF FM DATA-BROADCASTING
Toshiaki Yamamoto, Yutaka Masuko, and Hisakichi Yamane Dec. 1983 12 p
(NHK-SERIAL-293; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

An FM data broadcasting system in which data signals are multiplexed with an existing FM stereophonic broadcast is described. Signal multiplexing is accomplished by means of a supplementary subcarrier, which is amplitude-modulated through phase shift keying. Digital code signals identifying the broadcasting station, type of program, weather forecasts, or news are provided together with the FM program. By using these code signals, information is displayed at the receiver on a character display device, and the FM program can be automatically received and recorded. The technical feasibility of, and service configuration for, FM data broadcasting were investigated. An error correcting code is described and assessed. R.J.F.

N84-24920*# LinCom Corp., Los Angeles, Calif.
SATELLITE DATA TRANSMISSION (SDT) REQUIREMENT Final Report
C. M. Chie, M. White, and W. C. Lindsey Apr. 1984 185 p refs (Contract NAS5-27510)
(NASA-CR-175231; NAS 1.26:175231; LinCom-TR-0484-8219) Avail: NTIS HC A09/MF A01 CSCL 17B

An 85 Mb/s modem/codec to operate in a 34 MHz C-band domestic satellite transponder at a system carrier to noise power ratio of 19.5 dB is discussed. Characteristics of a satellite channel and the approach adopted for the satellite data transmission modem/codec selection are discussed. Measured data and simulation results of the existing 50 Mbps link are compared and used to verify the simulation techniques. Various modulation schemes that were screened for the SDT are discussed and the simulated performance of two prime candidates, the 8 PSK and the SMSK/2 are given. The selection process that leads to the candidate codec techniques are documented and the technology of the modem/codec candidates is assessed. Costs of the modems and codecs are estimated. A.R.H.

N84-24921*# Notre Dame Univ., Ind. Dept. of Electrical Engineering.
PERFORMANCE ANALYSIS OF THE WORD SYNCHRONIZATION PROPERTIES OF THE OUTER CODE IN A TDRSS DECODER
Daniel J. Costello, Jr. and Shu Lin (Hawaii Univ.) Feb. 1984 17 p ref
(Grant NsG-5234)
(NASA-CR-173551; NAS 1.26:173551) Avail: NTIS HC A02/MF A01 CSCL 17B

A self-synchronizing coding scheme for NASA's TDRSS satellite system is a concatenation of a (2,1,7) inner convolutional code with a (255,223) Reed-Solomon outer code. Both symbol and word synchronization are achieved without requiring that any additional symbols be transmitted. An important parameter which determines the performance of the word sync procedure is the ratio of the decoding failure probability to the undetected error probability. Ideally, the former should be as small as possible compared to the latter when the error correcting capability of the code is exceeded. A computer simulation of a (255,223) Reed-Solomon code as carried out. Results for decoding failure probability and for undetected error probability are tabulated and compared. A.R.H.

N84-24922*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CALCULATIONS OF ATMOSPHERIC TRANSMITTANCE IN THE 11 MICROMETER WINDOW FOR ESTIMATING SKIN TEMPERATURE FROM VISSR INFRARED BRIGHTNESS TEMPERATURES
Dennis Chesters 4 May 1984 41 p refs
(NASA-TM-86105; NAS 1.15:86105) Avail: NTIS HC A03/MF A01 CSCL 20N

An algorithm for calculating the atmospheric transmittance in the 10 to 20 micro m spectral band from a known temperature and dewpoint profile, and then using this transmittance to estimate the surface (skin) temperature from a VISSR observation in the 11 micro m window is presented. Parameterizations are drawn from the literature for computing the molecular absorption due to the water vapor continuum, water vapor lines, and carbon dioxide lines. The FORTRAN code is documented for this application, and the sensitivity of the derived skin temperature to variations in the model's parameters is calculated. The VISSR calibration uncertainties are identified as the largest potential source of error. E.A.K.

N84-24923*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
INVESTIGATION OF DYNAMIC NOISE AFFECTING GEODYNAMICS INFORMATION IN A TETHERED SUBSATELLITE Final Report, 1 Jun. 1983 - 31 May 1984
Gordon E. Gullahorn May 1984 116 p refs
(Grant NAG5-325)
(NASA-CR-173558; NAS 1.26:173558) Avail: NTIS HC A06/MF A01 CSCL 20N

The effects of a tethered satellite system's internal dynamics on the subsatellite were calculated including both overall motions (libration and attitude oscillations) and internal tether oscillations. The SKYHOOK tether simulation program was modified to operate with atmospheric density variations and to output quantities of interest. Techniques and software for analyzing the results were developed including noise spectral analysis. A program was begun

for computing a stable configuration of a tether system subject to air drag. These configurations will be of use as initial conditions for SKYHOOK and, through linearized analysis, directly for stability and dynamical studies. A case study in which the subsatellite traverses an atmospheric density enhancement confirmed some theoretical calculations, and pointed out some aspects of the interaction with the tether system dynamics. A.R.H.

N84-24924*# Ohio State Univ., Columbus. ElectroScience Lab.
ADAPTIVE ARRAYS FOR SATELLITE COMMUNICATIONS Final Report
Inder J. Gupta and Aharon A. Ksienski Jun. 1984 49 p refs (Grant NAG3-536)
(NASA-CR-173548; NAS 1.26:173548; ESL-716111-1) Avail: NTIS HC A03/MF A01 CSCL 17B

The suppression of interfering signals in a satellite communication system was studied. Adaptive arrays are used to suppress interference at the reception site. It is required that the interference be suppressed to very low levels and a modified adaptive circuit is used which accomplishes the desired objective. Techniques for the modification of the transmit patterns to minimize interference with neighboring communication links are explored. E.A.K.

N84-24925# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
A COMPUTER PROGRAM FOR POINT-SURFACE MICROWAVE CONTINUUM OBSERVATION
Niklas Holsti, Erkki Salonen, and Seppo Urpo 1983 140 p refs (Rept-S-141; ISBN-951-753-083-8; ISSN-0355-5712) Avail: NTIS HC A07/MF A01

This report describes the use and technical structure of a computer program for observation of pointlike radio sources in the microwave continuum, using the Metsahovi precision radio telescope, a 13.7 meter Cassegrain telescope on an alt-azimuth mounting. The program is capable of ON-ON or ON-OFF observation in either 1-point or 5-point patterns, with a Gaussian fit giving the pointing errors in the 5-point case. Integration times can be fixed or selected to give the same azimuth range for both receiver beams (auto sync) for variable sources the power spectrum of the variation can be computed. The program can also perform receiver calibration, or measure the optical depth of the atmosphere, for up to four receivers simultaneously. Measured data are stored on magnetic tape. Author

N84-24926# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
EXACT IMAGE THEORY FOR THE SOMMERFELD HALF-SPACE PROBLEM WITH A VERTICAL ELECTRIC DI-POLE
Ismo V. Lindell and Esko Alanen 1983 22 p refs
(Rept-S-144; ISBN-951-753-085-4; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

The exact image theory, for the Sommerfeld problem with a vertical magnetic dipole above a planar interface of two dielectric media, was extended to the more complicated problem of a vertical electric dipole. The image source is a line current, which lies in complex space for best convergence. The image current function is expressed as an integral expression, easily adapted for numerical calculations and its form is dependent on the dielectric factor ratio of the two half spaces. Series expansions are given for an easy calculation of the image current. The reflection coefficient method and Sommerfeld surface wave expressions are obtained as limit cases of the exact image theory. The method is tested for a large grid of field points. E.A.K.

N84-24927# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
ANALYSIS OF A CASSEGRAIN ANTENNA HAVING A GAUSSIAN ILLUMINATION PATTERN
James W. Lamb 1983 28 p refs Sponsored by Finnish Ministry of Education
(Rept-S-147; ISBN-951-752-984-8; ISSN-0355-5712) Avail: NTIS HC A03/MF A01

A Cassegrain antenna for a Gaussian illumination pattern using the aperture integration technique was analyzed. Loss of gain due to displacement of the feed horn both in the focal plane and along the antenna axis is calculated. The gain degradation which results from spillover on the main reflector which occurs when the feed horn is displaced laterally was examined. Aperture efficiency and the loss due to radome space frame and membrane were estimated. Specific values for the Metsahovi radio telescope are obtained. E.A.K.

N84-24928# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
IS A PARTIALLY FILLED CYLINDRICAL RESONATOR OPERATING ON THE TE SUB 011 MODE DESIRABLE FOR THE DETERMINATION OF PERMITTIVITY?
Ari Sihvola 1983 18 p refs
(Rept-S-148; ISBN-951-752-987-2; ISSN-0355-5712) Avail: NTIS HC A02/MF A01

The possibilities of using a partially filled circular cylindrical resonator operating on the TE011 mode for the measurement of the permittivity and the losses of dielectric was discussed. The method is suitable especially for liquids. Starting from the empty resonator fields, the analysis is extended to partially filled resonators, and the characteristic equation for the resonant frequency is derived in two different ways. Implicit formulas for the permittivity and the loss tangent, which are solved numerically, are presented. A simpler formula for the loss tangent was derived. The Born approximation leads to simple but justified formulas for diaphanous dielectrics. E.A.K.

N84-24929# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
ELECTROMAGNETIC COMPATIBILITY IN AEROSPACE VEHICLES
O. B. M. Pietersen 1 Nov. 1983 10 p refs Presented at NERG Symp. of Electromagnetic Compatibility, Delft, 4 Nov. 1982
(NLR-MP-83002-U) Avail: NTIS HC A02/MF A01

Electromagnetic compatibility in aerospace vehicles which requires careful consideration because of the generally high packing density of electronic equipment aboard aircraft or spacecraft, the complex cable hardness and the required reliability margins. The practical and computer aided methods which are in use to arrive at an undisturbed living together of electronic systems board these vehicles are reviewed. E.A.K.

N84-24930# Research Inst. of National Defence, Linkoeping (Sweden).
DESIGN AND CALIBRATION OF A CW COHERENT LASER RADAR
T. Claesson, K. Gullberg, D. Letalick, I. Renhorn, O. Steinvall, and A. Widen Jan. 1984 48 p refs
(FOA-C-30345-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

The design, calibration and performance of a CW coherent laser radar testbed system is described. Detector responsiveness and detector noise in a heterodyne system is considered. A detailed evaluation of beam propagation and phase front matching is given. The final system is supplemented with a digital image memory, a galvanometer scanner and a boresighted TV camera. Analysis of images obtained indoors from a diffuse reference target reveal the well known Rayleigh statistics for the signal amplitude and speckle 'cells' which on the average have a diameter equal to the tranceiver aperture. The influence of atmospheric turbulence on transmitter beam size and signal fluctuations is studied over a 500 m path. M.A.C.

N84-24931# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
DIFFRACTION OF A LINE SINK FIELD
Lars Falk Jan. 1984 23 p refs
(FOA-C-30353-E; ISSN-0347-3708) Avail: NTIS HC A02/MF A01; Research Inst. of National Defence, Stockholm KR 50

The problem of a line sink field scattered by a halfplane is

solved by simple reasoning without performing any explicit calculations. The solution is useful both as a canonical problem for the geometrical theory of diffraction and as the simplest possible example of an exact diffraction problem containing a caustic.
Author

N84-24932# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
INFORMATICS 1983: SIGNAL PROCESSING
Jan Kjellgren, Per Lindberg, Anders Nelander, Bjoern Nilsson, Torleiv Orhaug, Ove Steinvall, Lars Goetherstroem, Bengt Kleman, and Soeren Palmgren Dec. 1983 102 p refs In SWEDISH; ENGLISH summary
(FOA-A-30033-E; ISSN-0281-0212) Avail: NTIS HC A06/MF A01; Research Inst. of National Defence, Stockholm KR 50

The development in the field of signal processing basic concepts and processes are described. The discrepancies in the ways of looking at signal processing problems that developed in different fields of applications are outlined. Modern components used in signal processing are described. The use of signal processing methods is illustrated in a number of applications based on radio and radar technology, optics and hydroacoustics.
E.A.K.

N84-24933# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Direction Des Essais.
DESCRIPTION OF AN ELECTROMAGNETIC COMPATIBILITY LABORATORY [DESCRIPTION D'UN LABORATOIRE DE COMPATIBILITE ELECTROMAGNETIQUE]
Bertrand Rosenau 1984 21 p refs In FRENCH
(SNIAS-832-422-103) Avail: NTIS HC A02/MF A01

The need for fat, accurate, and reproducable tests for electromagnetic interference in airborne/spaceborne equipment and materials is discussed. Test procedures for electromagnetic interference generated and absorbed by susceptible equipment are reviewed. Methods of signal analysis and plans or a test facility are described.
Transl. by M.A.C.

N84-24934# Nebraska Univ., Lincoln.
SCATTERING AND DEPOLARIZATION OF ELECTROMAGNETIC WAVES--FULL WAVE SOLUTIONS Final Technical Report, 1 Mar. 1981 - 31 Aug. 1983
E. Bahar Griffiss AFB, N.Y. RADC Jan. 1984 44 p
(Contract F19628-81-K-0025; AF Proj. 2305)
(AD-A139810; RADC-TR-83-289) Avail: NTIS HC A03/MF A01 CSCL 20/14

Traditionally physical optics and perturbation theories have been used to derive the like and cross polarized scattering cross sections for composite random rough surfaces. To this end two scale models have been adopted and the rough surfaces are regarded as small scale surface perturbations that are superimposed on large scale, filtered surfaces. Thus the scattering cross sections are expressed as sums of two cross sections. The first accounts for specular point scattering. It is given by the physical optics cross sections for the filtered surface consisting of the large scale spectral components. The second accounts for Bragg Scattering. It is given by the perturbation cross section for the surface consisting of the small scale optical components that ride on the filtered surface.
GRA

N84-24935# Kansas Univ., Lawrence. Remote Sensing Lab.
THEORETICAL AND EXPERIMENTAL STUDY OF RADAR BACKSCATTER FROM SEA ICE
Y. S. Kim, R. K. Moore, and R. G. Onstott Jan. 1984 177 p
(Contract N00014-76-C-1105)
(AD-A139866; CRINC/RSL-TR-331-37) Avail: NTIS HC A09/MF A01 CSCL 20/14

A model is described for the radar backscatter from first-year and multiyear sea ice, based on simple scattering layers. The physical-optics model using an exponential correlation function is shown able to predict the signatures of first-year ice. The radiative transfer volume-scatter model can describe the backscattering from multiyear ice for frequencies higher than about X-band, while the surface scattering contribution has to be included for lower frequencies. A simple semi-empirical model is shown to be a good approximation to the radiative transfer model in describing the volume scattering contribution of multiyear ice. A parametric study was conducted to determine the possible ranges of sigma-o for multiyear ice and first-year ice using the theoretical models. Within reported ranges of values of physical characteristics of sea ice, the theoretical model behavior confirms the experimental findings that Ku- and X-band frequencies, and incidence angles larger than about 30 deg to 40 deg, are better than lower frequencies in discriminating multiyear ice from first-year ice.
GRA

N84-24936# Naval Research Lab., Washington, D. C.
H. F. FREQUENCY MANAGEMENT BY FREQUENCY SHARING AS ASSISTED BY MODELS UPDATED IN REAL-TIME Final Report
D. R. Uffelman, L. O. Harnish, and J. M. Goodman 21 Mar. 1984 25 p
(AD-A139896; NRL-MR-5284) Avail: NTIS HC A02/MF A01 CSCL 17/2

Frequency management systems for the high frequencies (HF) currently in use by the U.S. Department of Defense (DoD) rely heavily on manual selection of frequencies which have been allocated on a circuit by circuit basis. There is no capability to anticipate frequency changes (QSY's) in advance in a manner such that a frequency being released by one user can be utilized effectively and immediately by a second user. NRL has been examining a scheme by which a small computer of the HF channel can be made to perform very accurately to anticipate channel characteristics in a short term prediction mode. It is proposed that this model be utilized to provide automated frequency management which would allow one to anticipate frequency availability and thereby allow sharing of frequencies between several users (frequency pooling). Utilizing data obtained from an oblique sounder net on the East Coast of the United States, this report suggests a method by which this may be accomplished.
Author (GRA)

N84-24937# Lincoln Lab., Mass. Inst. of Tech., Lexington.
WIDEBAND INTEGRATED VOICE/DATA TECHNOLOGY Semiannual Technical Summary, 1 Apr. - 30 Sep. 1983
C. J. Weinstein 30 Sep. 1983 26 p
(Contract F19628-80-C-0002; ARPA Order 3673; AF Proj. 3T10)
(AD-A139924; ESD-TR-83-225) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report covers work in the following areas: development and technology transfer of a generalized compact LPC vocoder, development and experimental application of Packet Voice Terminals (PVTs) and internet stream gateways for packet voice and data experiments, and coordination and execution of multi-user internetwork packet speech experiments using the experimental wideband satellite network (WB SATNET).
GRA

N84-24938# Illinois Univ., Chicago. Electromagnetic Imaging Div.
POLARIZATION UTILIZATION IN RADAR TARGET RECONSTRUCTION: C-WIDE (MULTI-FREQUENCY) BAND RELATIONSHIP OF A TARGET'S CHARACTERISTIC OPERATORS WITH ITS UNIQUE SET OF NATURAL EIGENFREQUENCIES Final Report, 15 Jun. 1980 - 14 Jun. 1983
W. M. Boerner, J. R. Huynen, N. C. Mathur, B. Y. Foo, and J. D. Nespor 14 Dec. 1983 231 p
(AD-A140092; ARO-EL.83-12-14) Avail: NTIS HC A11/MF A01 CSCL 17/9

During the tenure of this initiation contract on Polarization Utilization in Radar Target Identification a center of excellence for research in high resolution radar polarimetry was established within the Electromagnetic Imaging Division (EMID), Communications Laboratory (CL), Department of Electrical Engineering and Computer Science (EECS), University of Illinois at Chicago (UIC) with the express purpose of advancing theoretical, computational and experimental methods for radar target detection in clutter; separation of useful target vector signal from noise and clutter;

classification of targets and/or clutter; target and/or clutter imaging, as well as target identification. To assist us in this endeavor, the College of Engineering, UIC, initially made available 2,200 sq. ft. laboratory space which now has expanded to 9,000 sq. ft. within SEL-4209/4210/4211 with adjacent side rooms, housing the CL-office, work and laboratory space for 18 research assistants and a DEC-VAX 11/750 and 780 Research Computer Processing System with some peripheral image processing, printing, color-graphics processors which were made available with partial funding from DoD-research offices and need to be further expanded. GRA

N84-24939# California Univ., Berkeley. Lab. for Electronics Research.
ELECTROMAGNETIC WAVE SCATTERING BY PARTIALLY-BURIED METALLIC AND DIELECTRIC OBJECTS Final Report
K. K. Mei Mar. 1984 20 p
(Contract DAAK29-80-K-0010)
(AD-A140109; ARO-17296.4-EL-A) Avail: NTIS HC A02/MF A01 CSCL 20/3

The objective of this research is to study the feasibility of computing electromagnetic wave scattering by objects which are buried or partially buried in a lossy ground. The data obtained through computer solutions of the related Maxwell's Equations can be applied to detection of plastic land mines, tunnels and natural resources. The method used in this investigation is based on the Unimoment method, a unique hybrid of analytical and numerical methods. The extension of the method to include lossy ground half-space was made possible by the development of special eigenfunctions which include the continuity of the air-ground interface. Results were obtained for scattering by buried body of revolution, buried body of revolution with arbitrary orientation and two-body scattering. GRA

N84-24940# California Univ., Livermore. Lawrence Livermore Lab.
FUNDAMENTAL MODE RECTANGULAR WAVEGUIDE SYSTEM FOR ELECTRON-CYCLOTRON RESONANT HEATING (ECRH) FOR TANDEM MIRROR EXPERIMENT-UPGRADE (TMX-U)
R. R. Hubert, B. Felker, B. W. Stallard, and C. W. Williams 1 Dec. 1983 5 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-009085; UCRL-89241; CONF-831203-131) Avail: NTIS HC A02/MF A01

The performance of the Tandem Mirror Experiment Upgrade (TMX-U) system, which is composed of four 200 kW pulsed gyrotrons operated at 28 GHz is described. This system uses WR42 waveguide inside the vacuum vessel, and includes barrier windows, twists, elbows, and antennas, as well as custom formed waveguides. Outside the TMX U vessel are directional couplers, detectors, elbows, and waveguide bends in a rectangular waveguide. An arc detector, mode filter, eight arm mode converter, and water load in the 2.5 in. circular waveguide are attached directly to the gyrotron. Other specific areas discussed include the operational performance of the TMX U pulsed gyrotrons, windows, and component arcing, alignment, mode generation, and extreme temperature variations. Solutions for a number of these problems are described. M.A.C.

N84-24941# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany). Bereich Datenverabeitung und Elektronik.
DEVELOPMENT AND INVESTIGATION OF A HIGH LEVEL TOKEN PASSING MODULE FOR LOCAL COMMUNICATION NETWORKS
W. Brehmer Sep. 1982 47 p refs In GERMAN; ENGLISH summary
(HMI-B-387; DE-142) Avail: NTIS HC A03/MF A01

A high level token passing protocol was developed for process control and data acquisition systems consisting of several stations with local computing power, each performing specific tasks in the system. These stations are interconnected by the process being monitored and controlled, and communicate via a separate communication medium. Each station gets the right to access this medium by means of a token message. The high level token message is structured like all other messages transmitted via the communication medium. The distribution of the access right to all stations is described by the token passing protocol, performed by the M 6800 microprocessor. The microprocessor based device interfacing the input/output port of a host computer to the communication medium is described. Author (ESA)

N84-24942# Merlin Gerin, Grenoble (France). Service Information.
ELECTROMAGNETIC COMPATIBILITY [LA COMPATABILITE ELECTROMAGNETIC]
Alain Charoy Mar. 1983 18 p refs In FRENCH
(CAHIERS-TECHNIQUES-120) Avail: NTIS HC A02/MF A01

The influence of common types of electromagnetic interference (EMI) on systems performance is outlined. Sources of EMI are indicated, civilian and military EMC standards are listed, remedies against EMI are suggested. Author (ESA)

N84-24943# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CHARACTERISTICS OF THE LOWER ATMOSPHERE INFLUENCING RADIO WAVE PROPAGATION
A. W. Biggs, ed. Loughton, England Feb. 1984 313 p refs In ENGLISH and FRENCH Symp. held in Spatind, Norway, 4-7 Oct. 1983
(AGARD-CP-346; ISBN-92-835-0347-3) Avail: NTIS HC A14/MF A01

The lower atmosphere and its characteristics which influence radio wave propagation were studied. The influence of rain and other particles, refraction effects, long range propagation were examined. The following topics were discussed: (1) meteorological and radiometeorlogical parameters which may influence terrestrial on earth-space radio links; (2) various models and methods to predict the effects of these parameters on radio waves; (3) the effect of turbulence and particle scattering on optical propagation; investigation of methods to overcome perturbations due to the propagation effects. For individual titles, see N84-24944 through N84-24970.

N84-24944# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
D-1 STATISTICAL MODEL OF TROPOSPHERIC MULTIPATH PROPAGATION [MODELE STATISTIQUE DE LA PROPAGATION PAR TRAJETS MULTIPLES TRAPOSPHERIQUES]
L. Boithias *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 2 p refs In FRENCH (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

The distribution of levels received on a visibility link which does not involve stable reflections on the ground can, in general, be represented by the Rice-Nakagami law because this law gives the statistical distribution of the sum of a deterministic vector and of an uncertain vector. When the deterministic vector has a null or negligible amplitude, a Rayleigh law is obtained. The essential problem is to find the relations between the parameters of the distribution and those of the link (distance, frequency, climate, etc.). Current models of these relations flow from two propositions. The sum of the power transported by the deterministic vector and of that transported by the uncertain vector is an uncertain variable whose average is equal to the power received in free space and the variation type is proportional to the distance. For inferior distances around 50 km, the variation type can be considered as null (the sum of the powers is a certain quantity). The power transported by the deterministic vector decreases exponentially.
Transl. by A.R.H.

N84-24945# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
TWO TYPES OF ERRORS MADE IN PREDICTION WAVE ATTENUATION BY RAIN [DEUX TYPES DERREURS FAITES DANS LA PREVISION DE ATTENUATION DES ONDES PAR LA PLUIE]

L. Boithias *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 10 p refs In FRENCH; ENGLISH summary (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Most methods proposed for predicting wave attenuation due to rain aim to derive the statistical distribution of attenuation on a path from the statistical distribution of rain rate at a point of the path. For that, these methods require the choice of a space model of rainy area or rainy volume. It appears that two erroneous assumptions are often made in these models. In the horizontal rain model there is confusion in the general concept of rain cells, between the rainy area of 15 to 20 kilometers in diameter which has to be considered for rain attenuation and the core of a few kilometers in diameter which has to be considered for rain scatter. In the vertical rain model, there is confusion between the vertical extent of rain fall and the height of 0 deg isotherm. In fact these quantities may be significantly different especially for low latitudes. These two erroneous assumptions are partly responsible for delaying the elaboration of a simple and reliable rain model for the prediction of rain attenuation. A.R.H.

N84-24946*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Satellite Communications Group.
ICE DEPOLARIZATION ON LOW-ANGLE 2 GHz SATELLITE DOWNLINKS
W. L. Stutzman, C. W. Bostian, A. Tsolakis, and T. Pratt *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 11 p refs Sponsored in part by NASA and International Telecommunications Satellite Organization Prepared in cooperation with International Telecommunications Satellite Organization, Washington, D.C., and JPL, California Inst. of Tech., Pasadena (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

The impact of ice depolarization on the statistical performance of satellite downlinks were investigated. Propagation data recorded during 1979 and 1980 to see what impact of ice depolarization on link performance were analyzed. The effects on the cross polarization discrimination (XPD) statistics amounted to at most a 2 to 4 dB reduction in the XPD values which rain would have produced for a given percentage of time. Ice depolarization had no effect on the statistics of XPD values below the 0.01% level. Most of the severe ice depolarization events were associated with drops in barometric pressure and the passage of intense cold fronts through our area. Ice contents as the product of three individually undetermined quantities were defined: ice particle density, ice cloud thickness, and the average volume of the ice crystals. It is indicated that populations of ice particle with ice contents on the order of 0.002 m4/m3 are probably responsible for the lower values of measured XPD. E.A.K.

N84-24947# Rome Air Development Center, Hanscom AFB, Mass. Electromagnetic Sciences Div.
THE EFFECT OF A LOW-ALTITUDE NUCLEAR BURST ON MILLIMETER WAVE PROPAGATION
Edward E. Altshuler *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 18 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

The limitations imposed on millimeter wave propagation by the dust produced by a low altitude nuclear burst were examined. The closer the burst is to the surface, the larger will be the dust loaded into the nuclear fireball, an extremely hot and highly ionized spherical mass of air and gaseous weapon residues. The fireball absorbs, scatters and refracts the propagated wave and may also produce scintillations. Only the losses due to absorption and scattering are calculated. A sensitivity analysis of attenuation dependence on the pertinent dust parameters was conducted. It was found that the dust attenuation is very heavily dependent on the maximum particle radius, the number of large particles in the distribution and the real and imaginary components of the index of refraction over the range from dry sand to clay. The attenuation is also proportional to the fraction of the atmosphere filled with dust. The attenuation includes losses due to fireball ionization, dust and atmospheric oxygen and water vapor. Results are obtained as a function of time after burst, distance from burst, elevation angle and frequency up to 95 GHz. It is found that very high attenuations occur within about 20 seconds after the burst if the path intersects the fireball. At later times attenuations of the order of tens of dB are possible due to dust alone. After several minutes the larger dust particles have settled and attenuations of several dB are present. E.A.K.

N84-24948# Norwegian Telecommunications Administration Research Establishment, Kjeller.
MEASUREMENTS OF ATMOSPHERIC EFFECTS ON SATELLITE LINKS AT VERY LOW ELEVATION ANGLE
Odd Gutteberg *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 12 p refs Sponsored in part by ESA (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Propagation measurements with the Orbital Test Satellite (OTS) at the Arctic islands of Spitzbergen (78 deg) are reported. The elevation angle to the satellite was 3.2 deg and the frequency 11.8 GHz. The experiments included: measurements of atmospheric scintillations, cross polarization discrimination and space diversity improvements. It is shown that the distributions of the received satellite beacon amplitude can be approximated by Rice distributions. Large diversity gain was obtained by using horizontal spacing of 1 km. A wideband (TV) transmission experiment was also performed. E.A.K.

N84-24949# Naval Ocean Systems Center, San Diego, Calif.
BLUE-GREEN PROPAGATION THROUGH CLOUDS Abstract Only
G. C. Mooradian *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 1 p (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Optical communications in the atmosphere, space and underwater was investigated. The performance of a space to Earth/underwater link through the adverse atmospheric propagation channel is of paramount importance. The presence of clouds along the propagation path scatter the blue-green radiation and cause spatial, angular, and temporal spreadings of the beam. This condition decreases the peak power at the receiver by both multipath time delays, and spatial spreading and also increases the apparent source size. Performance may be seriously degraded. This effect are somewhat compensated for by adapting the receiver; increasing the field of view of the receiver to accept the scattered radiation. The temporal, spatial, and angular spreading of a blue-green pulse through clouds and fogs are measured as a function of optical thickness and receiver field of view. E.A.K.

N84-24950# Naval Research Lab., Washington, D. C.
THE EFFECTS OF METEOROLOGY ON MARINE AEROSOL AND OPTICAL AND IN PROPAGATION
Stuart G. Gathman *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 16 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Optical and IR propagation which can be strongly influenced by aerosol in the marine boundary layer is discussed. The effects are wavelength dependent to use in all cases. Sources and sinks of this aerosol in operation over the ocean can be predicted from a full knowledge of the meteorological situation. Once airborne the spatial distribution of the aerosol is a function of the mixing processes, the micrometeorology of the marine boundary layer and the history of these processes to which the aerosol is exposed. The marine aerosol size distribution, which describes the concentration of droplets for each size class, is modeled from standard meteorological parameters and the resultant extinction and absorption is calculated from the size distribution for wavelengths of from 0.2 to 40.0 micrometers using Mie theory. The model uses the stored historical marine data bases to produce clima-

tologies of the optical and IR properties over the oceans. The art of meteorological forecasting can be employed to forecast the necessary model inputs from which desired future optical, and IR properties can be determined. E.A.K.

N84-24951# Portsmouth Polytechnic (England). Dept. of Electrical and Electronic Engineering.
A SYSTEM TO MEASURE LOS ATMOSPHERIC TRANSMITTANCE AT 19 GHz
E. Vilar, T. J. Moulsley, J. Austin, A. Hewitt, J. R. Norbury (Science Research Council, Chilton, England), and S. K. Barton (Science Research Council, Chilton, England) *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 16 p refs Sponsored in part by UK Departmental Users Committee (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

The principles of a wideband test system for measuring the complex transmittance of a line-of-sight (LOS) microwave radio link subject to fading and multipath are discussed. The technique which uses cross-correlation between pseudo-binary random sequences falls into the realm of spread spectrum techniques. The system described is designed cover 1 GHz bandwidth at 19 GHz and has the objective of measuring both co-polar and cross-polar transmittance thus generating the complex transmittance matrix. Computer simulations and preliminary experimental results are presented together with a brief initial comparison with other systems. M.G.

N84-24952# Science Research Council, Chilton (England).
A GaAs REFRACTOMETER FOR TROPOSPHERIC STUDIES
U. M. Yilmaz, G. R. Kennedy, and M. P. M. Hall *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 6 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

A microwave refractometer designed to be used in studies of multipath propagation on line-of-sight microwave links, and studies of transhorizon ducting is described. The application of a GaAs FET amplifier in a feedback loop containing the sampling cavity produced a lightweight and simple refractometer which was tested and used in a light aircraft with on-board data processing. These various aspects are discussed in some detail, together with the background requirements and specification. M.G.

N84-24953# National Telecommunications and Information Administration, Boulder, Colo.
PREDICTION OF MULTIPATH FADING ON TERRESTRIAL MICROWAVE LINKS AT FREQUENCIES OF 11 GHz AND GREATER
Douglass D. Crombie *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 9 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Published data on the probability of multipath fading on different paths with lengths of to 45 km, at frequencies up to 37 GHz, measured in different countries, were analyzed. For the paths which have probabilities greater than 0.001% for 20 dB fades, it is found that the fading probability increases with antenna beam width. In addition, it is found that increasing the clearance of the path above surrounding terrain reduces the fading probability. Inclusion of these two variables, in addition to frequency and path length, reduces the uncertainty in prediction of fading probability by a factor of 80. Author

N84-24954# Centre National d'Etudes des Telecommunications, Issy-les-Moulineaux (France).
EFFECT OF LEAP LENGTH ON THE QUALITY OF LARGE CAPACITY NUMERICAL LINKAGES [EFFET DE LA LONGUEUR DU BOND SUR LA QUALITE DES LIAISONS NUMERIQUES A GRANDE CAPACITE]
J. Battesti *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 4 p refs In FRENCH (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

With regards to the selectivity fadings due to multiple paths, these fadings produce signal degradation that is more important than that of a nonselective fading of the same profundity. This occurs as if the capacity of the equipment for fading were reduced in the presence of multipath propagation and leads to the introduction of the notion of sharply-defined capacity as opposed to the rough capacity measured in the case of nonselective fading. It is shown that, for a numeric signal of given characteristics (numeric debit, type of modulation) the finely defined capacity is independent of the length of the shift. Transl. by A.R.H.

N84-24955# Bell Telephone Labs., Inc., Holmdel, N. J.
MULTIPATH OUTAGE PERFORMANCE OF DIGITAL RADIO RECEIVERS USING FINITE-TAP ADAPTIVE EQUALIZERS
N. Amitay and L. J. Greenstein *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 10 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Recent analysis/simulation studies have quantified the multipath outage statistics of digital radio systems using ideal adaptive equalization. The use of finite-tap delay line equalizers is considered with the aim of determining how many taps are needed to approximate ideal performance. To this end, is considered an M-level QAM system using cosine rolloff spectral shaping and an adaptive equalizer with either fractionally-spaced or synchronously-spaced taps is assumed. A widely used statistical model for the fading channel is used. For each trial, we compute a detection signal-to-distortion measure, suitably maximized with respect to the tap gains. One can thereby obtain probability distributions of this measure for specified combinations of system parameters. These distributions, in turn, can be interpreted as outage probabilities (or outage seconds) vs. the number of modulation levels. A major finding is that, for the assumed multipath fading model, very few taps (the order of five) are needed to approximate the performance of an ideal infinite-tap equalizer. It is also found that a simple, suboptimal form of timing recovery is generally quite adequate; and that fractionally-spaced equalizers are more advantageous than synchronously-spaced equalizers with the same number of taps. This advantage is minor for rolloff factors of 0.5 and larger but increases dramatically as the rolloff factor approaches zero. M.G.

N84-24956# Technische Hogeschool, Delft (Netherlands). Dept. of Electrical Engineering.
SPHERICAL PROPAGATION MODELS FOR MULTIPATH-PROPAGATION PREDICTIONS
L. P. Ligthart *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 8 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Multipath fading leads to a limitation in the availability and/or reliability of microwave links. To study the propagation mechanism under fading conditions propagation models, based on ray theory, above a spherical earth were developed and compared to the well-known planar propagation model above a flattened earth. The reasons for studying spherical propagation models are: (1) to avoid the limitation of small elevation angles in planar propagation models, (2) to investigate the computed and measured path delay on the microwave line of sight links, and (3) to set up an analytical approach for the spherical propagation model without numerical difficulties and computing-time intensive procedures. Computational results of the models are shown, including and accuracy analysis, and the use of spherical propagation models is illustrated for surface duct layers above water. M.G.

N84-24957# Netherlands Foundation for Radio Astronomy, Dwingelo.
CORRECTING RADIO ASTRONOMY INTERFEROMETRY OBSERVATIONS FOR IONOSPHERIC REFRACTION
T. A. Th. Spoelstra *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 8 p refs Sponsored in part by The Netherlands Organization for the

Advancement of Pure Research (Z.W.O.) (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Radio astronomical observations with local interferometers and very long baseline interferometers (VLBI) are affected by atmospheric (i.e., tropospheric and ionospheric) refraction. A correction procedure for ionospheric refraction for radio astronomy interferometry is reviewed. This correction is applied to observations made with the Westerbork Synthesis Radio Telescope (WSRT). The method used for WSRT observations can also be used to correct VLBI observations for ionospheric refraction. If networks of ionosonde and satellite observing stations operate during the astronomical VLBI observations, pathlength corrections ranging from several wavelengths to a fraction of a wavelength are possible, provided the geographical distribution of these stations is similar to the VLBI network. The possibilities of this procedure are compared with the results derived by e.g., dual frequency VLBI observations. R.J.F.

N84-24958# Plessey Radar Ltd., Chessington (England). Operational Research.
THE ESTIMATION AND CORRECTION OF REFRACTIVE BENDING IN THE AR3-D TACTICAL RADAR SYSTEMS
Frank Barker *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 15 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

The development of techniques for the estimation and correction of refractive bending, in the vertical plane, in the evolution of a family of radar systems is discussed. The systems are based on the AR3-D radar and are in service in several countries and climates. After a brief description of the AR3-D radar systems, the Operational requirements, the Engineering solutions, some of the Human Factors which affect the design and implementation, and future possibilities are discussed. A simple and exact approach to sensitivity analysis is given. A fast algorithm for the online correction of radar plot elevation data is given. The need for education on refractive effects and for understanding the possibilities which exist for estimation and correction in 3-D radar systems is emphasized. R.J.F.

N84-24959# Florence Univ. (Italy).
EFFECT OF MULTIPLE SCATTERING ON THE PROPAGATION OF LIGHT BEAMS IN DENSE NONHOMOGENEOUS MEDIA
P. Bruscaglioni, A. Ismaelli, L. LoPorto, and G. Zaccanti *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 13 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Calculations performed by means of a Monte Carlo method show that the contribution of forward single and multiple scattering to the received power in an optical transmission link through a turbid atmosphere increases when the scattering medium is more concentrated near the receiver. An experimental check of this result is also presented. Author

N84-24960# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ADAPTIVE COMPENSATION FOR ATMOSPHERIC TURBULENCE EFFECTS ON OPTICAL PROPAGATION
Darryl P. Greenwood *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 10 p refs Sponsored in part by DARPA (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Optical wavefronts propagated in atmospheric turbulence suffer significant degradation manifested as beam spread, beam wander, and scintillation. The state of progress of this field of research is reviewed as well as recent efforts to overcome the limiting effects of refractive turbulence. Adaptive optical systems are being developed to sense the phase distortion present on propagated beams and to compensate for these aberrations in real time. Equations describing the magnitude of the turbulence effect and also describing the degree to which compensation may be achieved are given. Supporting data are presented as well. R.J.F.

N84-24961# D-Peek, Inc., Boulder, Colo.
EFFECTS OF ATMOSPHERIC TURBULENCE ON OPTICAL PROPAGATION
Robert S. Lawrence *In* AGARD Characteristics of the Lower Atmospher Influencing Radio Wave Propagation Feb. 1984 8 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

The optical refractive index of the atmosphere depends on temperature, pressure, and humidity. Naturally occurring variations of these quantities, with scales of a few centimeters and associated with atmospheric turbulence, cause optical scintillation, image distortion, and laser beam broadening. The meteorological conditions that influence the occurrence of this optical turbulence are reviewed. The optical significance of turbulence at various heights in the atmosphere is discussed. The differences between these optical effects and the corresponding phenomena at radio wavelengths are pointed out. While beam broadening increases indefinitely with the strength of optical turbulence, scintillation saturates and eventually decreases with increasing turbulence. This important effect is discussed and a phenomenological theory that explains it is given. Estimates are given of the limitations imposed by atmospheric turbulence on various types of optical systems. The techniques that can be used to measure optical turbulence are discussed. R.J.F.

N84-24962# Service Meteorologique Metropolitan, Paris (France).
D-19 EVALUATING THE HEIGHT OF TROPOSPHERIC CONDUCTION OF EVAPORATION [EVALUATION DE LA HAUTEUR DU CONDUIT TROPOSPHERQUE DEVAPORATION]
B. Strauss *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 8 p refs In FRENCH (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

The first attempts to estimate the height of the conduction of evaporation from outputs of a numerical prediction model used in meteorology are presented. The model of the European Center of midterm weather forecasting is used. Outputs in grid points of wind at 10 meters, temperature and Td at 2 meters, and ocean surface temperature are used in the calculations. The method is tested on a section of the North Atlantic and on a zone of the Indian Ocean by comparing estimates from the model with marine meteorological observations. A.R.H.

N84-24963# Marconi Co. Ltd., Great Baddow (England).
A RADIO INTERFERENCE MODEL FOR WESTERN EUROPE
S. Rotheram *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 15 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Field strength distributions for 106 land, sea and mixed paths of three terrain types are analyzed for their dependence on scattering angle, probability, terrain type, frequency and terminal height. Good models are derived for the sea and low terrain land paths. The medium and high terrain land paths show greater variability. The frequency dependence is shown to be weak. The dependence on terminal heights is shown to be nonexistent except for the effect on the scattering angle. Mixed paths are shown to be like land paths and are quite unlike sea paths.Author

N84-24964# Consiglio Nazionale delle Ricerche, Bologna (Italy). Inst. di Radioastronomy.
TRANSHORIZON MICROWAVE PROPAGATION MEASUREMENTS RELATED TO SURFACE METEOROLOGICAL PARAMETERS
R. Ambrosini, M. Caporaloni (Bologna Univ., Italy), and G. Tomassetti *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 6 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Experimental results of three months of continuous measure-

ments at 3cm. wavelengths are given for the following aligned paths; the first, 100 Km. long, over flat land (Po Valley); the second, 140 Km. long, across the Adriatic Sea; the third consisting of the sum of the previous ones. The stations are linked to radiowaves only during super standard atmospheric conditions. The period considered was in the autumn-winter season, from October to December, for 92 days of observations. Hourly efficiency istograms are drawn. They present a peculiar trend for the different paths; variable over land, with a strong maximum in the nocturnal hours; almost constant over sea, with a characteristic peak around noon for the combined path. Efficiencies up to 43% have been measured on flat land during the night, while lower values were found on the sea. An attempt to find a direct connection between radio signal reception in super standard conditions and surface meteorological parameters has shown a strong correlation with water vapor pressure for the sea path; radio ducting sets up for a monotonic decoying of the water content of the air. Measurements over flat land show radio ducting to be almost nocturnal phenomenon. Radio propagation beyond the horizon detects temperature inversions caused by nocturnal cooling and therefore, there is not very clear evidence of correlation with ground meteorological data. Author

N84-24965# Naval Ocean Systems Center, San Diego, Calif. Ocean and Atmospheric Sciences Div.

TROPOSPHERIC PROPAGATION ASSESSMENT

K. D. Anderson, J. H. Richter, and H. V. Hitney *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 6 p refs (For primary document see N84-24943 15-32)

Avail: NTIS HC A14/MF A01

It is well known that microwave propagation in a marine environment frequently exhibits unexpected behavior. The deviation from 4/3 earth propagation calculations is due to the fact that the vertical refractivity distribution of the troposphere rarely follows the standard lapse rate of -39 N/km. Instead, the troposphere is generally composed of horizontally stratified layers of differing refractivity gradients. The most striking propagation anomalies result when a layer gradient is less than -157 N/km, forming a trapping layer. In the marine environment, there are two mechanisms which produce such layers. An elevated trapping layer is created by the advection of a warm, dry air mass over a cold, moist air mass producing either a surface-based or an elevated duct which may affect frequencies as low as 100 MHz. A very persistent surface trapping layer is due to water evaporation at the air-sea interface. This surface, or evaporation duct is generally thin, on the order of 10 m in vertical extent, and is an effective trapping mechanism for frequencies greater than 3 GHz. With the introduction of the Integrated Refraction Effects Prediction System (IREPS) into the US Navy, fleet units now have the capability to evaluate accurately the performance of their EM systems when the refractive environment is known. However, these units may have to plan for operations thousands of miles away under different refractivity conditions. To assist in planning, a worldwide upper air and surface climatology has been developed for use through the IREPS programs. The IREPS concept is reviewed and a description of the tropospheric ducting data base is presented. Author

N84-24966# Brunel Technical Coll., Bristol (England). Dept. of Radiocommunications and Radar.

DISTORTION OF A NARROW RADIO BEAM IN A CONVECTIVE MEDIUM

W. G. Burrows *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 21 p refs (For primary document see N84-24943 15-32)

Avail: NTIS HC A14/MF A01

In considering the basic mechanism of heat exchange by convective circulation in the atmosphere it is apparent that the resultant thermal cell structures, as proposed by Benard, may possess refractive index properties which will influence the cross-sectional shape of a narrow conical radio beam. A simplified classical toroidal cell is considered for the purpose of analysis to show that the core of such a cell in the atmosphere may act as a cylindrical concave lens. The resultant distortion of a narrow beam is then discussed. The concept if then developed further to show that trans-horizon propagation may result from an in-line array of thermal cells. Author

N84-24967# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

ANOMALOUS PROPAGATION AND RADAR COVERAGE THROUGH INHOMOGENEOUS ATMOSPHERES

H. W. Ko, J. W. Sari, M. E. Thomas, P. J. Herchenroeder (ESD, Hanscom AFB, Mass.), and P. J. Martone *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 14 p refs (For primary document see N84-24943 15-32)

(Contract N00024-83-C-5301)

Avail: NTIS HC A14/MF A01

A method is outlined which enables radar coverage predictions to be made under anomalous propagation conditions. Spatial and temporal changes in the height and strength of refractive layers in the troposphere are known to compromise radar coverage. Refractive layers may create coverage voids by diverting rays and may introduce anomalous clutter and range height errors in radar systems. In this paper, elements of meteorology, atmospheric boundary layer physics, and electromagnetic wave propagation are combined to investigate the effect of inhomogeneous refractive layers on radar coverage. A computer program called EMPE (Electromagnetic Parabolic Equation) has been developed to aid in these investigations. A special feature of EMPE is its ability to deal with inhomogeneous atmospheric changes in both the horizontal and vertical directions. Predictions for anomalous wave behavior have been made for frequencies from 100 MHz to 10 GHz. The results are relevant to a variety of microwave electromagnetic systems such as those used for communications, radar, and aircraft instrument landing. Author

N84-24968# British Broadcasting Corp., Kingswood (England).

THE PREDICTION OF FIELD STRENGTH IN THE FREQUENCY RANGE 30 - 1000 MHz

R. S. Sandell and D. W. Taplin *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 10 p refs (For primary document see N84-24943 15-32)

Avail: NTIS HC A14/MF A01

The background of the BBC's involvement in propagation measurement at VHF and UHF is outlined. Weaknesses in the original data are discussed. The accuracy of prediction is related to the accuracy of measurement as illustrated by an experiment dating to the development period of an interim BBC prediction method for UHF, and the accuracy of the current path loss prediction method is discussed. Possible directions of future development in prediction methods are indicated and the objectives of the BBC's research in this area are outlined. E.A.K.

N84-24969# Communications Research Centre, Ottawa (Ontario).

VHF AND UHF PROPAGATION IN THE CANADIAN HIGH ARCTIC

R. S. Butler, J. I. Strickland, and C. Bilodeau *In* AGARD Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 8 p (For primary document see N84-24943 15-32)

Avail: NTIS HC A14/MF A01

Radio propagation in the Arctic maritime environment was studied. Five UHF radio paths between pairs of elevated points were selected along a 300 km east-west line which parallels a potentially important navigation route through the Arctic islands. Two VHF paths, each between an elevated site and a point near sea level were also chosen to simulate communications with a ship. Partial results from the summer to winter transition season show that propagation between the elevated points is highly reliable, but that propagation along the slanted paths appears to be strongly affected by radio wave ducting. E.A.K.

N84-24970# Royal Signals and Radar Establishment, Malvern (England).

CONSIDERATIONS PERTINENT TO PROPAGATION PREDICTION METHODS APPLIED TO AIRBORNE MICROWAVE EQUIPMENT

T. Almond *In* Agard Characteristics of the Lower Atmosphere Influencing Radio Wave Propagation Feb. 1984 11 p refs (For primary document see N84-24943 15-32)
Avail: NTIS HC A14/MF A01

Current coverage diagrams for certain airborne microwave equipments which include radars, navigation aids, communications, countermeasures sets and command links are outlined. Coverage diagrams are affected by large-scale atmospheric refraction and superrefraction. Techniques of operational use for sounding the meteorological and radioelectrical characteristics of the troposphere and coverage prediction methods are reviewed. It is concluded that there is an unreasonable reliance on horizontal homogeneity in the current prediction techniques coupled with inadequate lateral spatial sampling of the tropospheric structure.
E.A.K.

N84-24638*# Grumman Aerospace Corp., Bethpage, N.Y.
EFFECT OF SPACE ENVIRONMENT ON SPACE-BASED RADAR PHASED-ARRAY ANTENNA (A0133)
Richard J. Delasi, Martin L. Rossi, James B. Whiteside, Martin Kesselman, Ronald L. Heuer, and Frederick J. Kuehne *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 21-23 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20N

N84-24971# Joint Publications Research Service, Arlington, Va.
WORLDWIDE REPORT: TELECOMMUNICATIONS POLICY, RESEARCH AND DEVELOPMENT
29 Feb. 1984 78 p Transl. into ENGLISH from various articles (JPRS-TTP-84-005) Avail: NTIS HC A05/MF A01

This serial report contains news items, abstracts, and articles of scientific reports on aspects of telecommunications policy, and research and development including telephone technology, international law, transmission stations, communication satellites, computers, and jamming. For individual titles, see N84-24972 through N84-24972.

N84-24972# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL LAW GIVES STATES RIGHT TO JAM FOREIGN RADIO BROADCASTS
G. Timofeyeva *In its* Worldwide Rept.: Telecommun. Policy, Res. and Develop. (JPRS-TTP-84-005) 29 Feb. 1984 p 30-32 Transl. into ENGLISH from Argumenty i Fakty (USSR), no. 48, 29 Nov. 1983 p 7 (For primary document see N84-24971 15-32)
Avail: NTIS HC A05/MF A01

A series of documents was adopted by the UN and UNESCO emphasizing attention on the need to use the mass information media in the interest of peace, detente, development of international cooperation and against the arms race. The role of jamming foreign broadcasts as an aid to maintaining internal order was discussed.
B.G.

N84-25415# Indian Inst. of Tech., Bombay. School of Applied Sciences.
ON THE BREAKDOWN OF ACCELERATION WAVES IN RADIATIVE MAGNETO-FLUIDS
Arisudan Rai and M. Gaur *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 233-242 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-24973*# TRW Electronic Systems Group, Redondo Beach, Calif.
K-BAND LATCHING SWITCHES Final Report
W. S. Piotrowski and J. E. Raue May 1984 77 p
(Contract NAS3-22336)
(NASA-CR-168253; NAS 1.26:168253; Rept-11982) Avail: NTIS HC A05/MF A01 CSCL 09A

Design, development, and tests are described for two single-pole-double-throw latching waveguide ferrite switches: a K-band switch in WR-42 waveguide and a Ka-band switch in WR-28 waveguide. Both switches have structurally simple junctions, mechanically interlocked without the use of bonding materials; they are impervious to the effects of thermal, shock, and vibration stresses. Ferrite material for the Ka-band switch with a proper combination of magnetic and dielectric properties was available and resulted in excellent low loss, wideband performance. The high power handling requirement of the K-band switch limited the choice of ferrite to nickel-zinc compositions with adequate magnetic properties, but with too low relative dielectric constant. The relative dielectric constant determines the junction dimensions for given frequency responses. In this case the too low value unavoidably leads to a larger than optimum junction volume, increasing the insertion loss and restricting the operating bandwidth. Efforts to overcome the materials-related difficulties through the design of a composite junction with increased effective dielectric properties efforts to modify the relative dielectric constant of nickel-zinc ferrite are examined.
A.R.H.

N84-24974*# Virginia Univ., Charlottesville. Dept. of Electrical Engineering.
DESIGN CONSIDERATIONS FOR A MONOLITHIC, GaAs, DUAL-MODE, QPSK/QASK, HIGH-THROUGHPUT RATE TRANSCEIVER M.S. Thesis
Richard A. Kot, James D. Oliver, and Stephen G. Wilson Jun. 1984 207 p refs
(Grant NAG3-316)
(NASA-CR-173560; NAS 1.26:173560; UVA/528219/EE84103) Avail: NTIS HC A10/MF A01 CSCL 09C

A monolithic, GaAs, dual mode, quadrature amplitude shift keying and quadrature phase shift keying transceiver with one and two billion bits per second data rate is being considered to achieve a low power, small and ultra high speed communication system for satellite as well as terrestrial purposes. Recent GaAs integrated circuit achievements are surveyed and their constituent device types are evaluated. Design considerations, on an elemental level, of the entire modem are further included for monolithic realization with practical fabrication techniques. Numerous device types, with practical monolithic compatability, are used in the design of functional blocks with sufficient performances for realization of the transceiver.
A.R.H.

N84-24975*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Electrical Engineering.
INPUT FILTER COMPENSATION FOR SWITCHING REGULATORS Final Report
F. C. Lee 1984 368 p refs
(Grant NAG3-220)
(NASA-CR-173557; NAS 1.26:173557) Avail: NTIS HC A16/MF A01 CSCL 09C

Problems caused by input filter interaction and conventional input filter design techniques are discussed. The concept of feedforward control is modeled with an input filter and a buck regulator. Experimental measurement and comparison to the

analytical predictions is carried out. Transient response and the use of a feedforward loop to stabilize the regulator system is described. Other possible applications for feedforward control are included. M.A.C.

N84-24976# Korf-Stahl A.G., Baden-Baden (West Germany).
REDUCED ELECTRIC REACTANCE FOR ELECTRIC ARC FURNACE Final Report, Jun. 1981
Rudolf Kasper Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 18 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-303; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 4

The reduction of the high current circuit reactance of 3-phase electric arc furnaces which will increase the thermoelectric efficiency is discussed. The improvement is expected to result in savings of electricity and other consumables and in reduced network turbulations. The reactance can be decreased by shortening or completely eliminating the flexible high current cables. To allow for the necessary tilting movements of the furnaces when tapping, disconnecting separations are designed which permit a mechanical separation of the high current circuit during current free situation. E.A.K.

N84-24977# Gesellschaft fuer Elektrischen Strassen-Verkehr m.b.H., Essen (West Germany).
DEVELOPMENT OF A NEW CHARGER SYSTEM Final Report, Mar. 1983
Rainer vonCourbiere, Frank Klein, Peter Kolen, Fokke Oosterhoff, and Reiner Thomas Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 285 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-305; ISSN-0340-7608) Avail: NTIS HC A13/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 45

Chopper type charger-baseline units with up to 3,5 kW power were developed. The advantages of the technology can be proven with the three variations: (1) Step-up converter with mains transformer; (2) Step-up converter with step down converter; and (3) Step-up converter with forward converter By applying these types of power controls it was nearly possible to create the main correspondent behavior of an ideal ohmic load. The power and energy efficiencies are increased by up to 60 %. A computerized data aquisition system was used. E.A.K.

N84-24978# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
FEED SYSTEM FOR THE METSAEHOVI COOLED 75-95 GHz RECEIVER
James W. Lamb, Antti V. Raeisaenen, and Martti E. Tiuri 1983 28 p refs
(Rept-S-146; ISBN-951-752-983-X; ISSN-0355-5712) Avail: NTIS HC A03/MF A01

A feed system for the cooled 75 - 95 GHz receiver which will be used on the Metsahovi telescope was designed. The system may be used for dual and single beam radio astronomy measurements. A polarimeter was designed to obtain the complete set of polarization parameters of an incoming wave. Antennas were tested and shown that the aperture efficiency of the telescope with this feed system is 16% at 95 GHz and 21% at 80 GHz. E.A.K.

N84-24979# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
LSI/VLSI (LARGE SCALE INTEGRATION/VERY LARGE SCALE INTEGRATION) ION IMPLANTED GaAs (GALLIUM ARSENIDE) IC PROCESSING Final Report, 25 Jul. 1980 - 30 Sep. 1982
R. R. Zucca, C. G. Kirkpatrick, P. M. Asbeck, F. H. Eisen, and C. P. Lee Jan. 1984 147 p
(Contract F49620-80-C-0101; ARPA Order 3384; DA Proj. 3384) (AD-A139676; MRDC41070.25FR; AFOSR-84-0230TR) Avail: NTIS HC A07/MF A01 CSCL 09/5

This report covers a program designed to realize the full potential of GaAs integrated circuits by expanding and improving fabrication and material techniques. The main accomplishment of the program was the successful implementation of the fabrication of integrated circuits on 3-inch diameter GaAs wafers. In addition, this program covered many activities related to GaAs IC processing. These include: work on semi-insulating material growth and characterization, investigation of ion implantation techniques (work carried out at the California Institute of Technology); evaluation of device uniformity, and investigation of its controlling factors; investigation of metallization yield and reliability, and improvements of processing techniques resulting from this study; design and testing of a multiplier and programmable shift registers/pattern generators; evaluation of mask programmable logic arrays to meet ERADCOMs needs for high performance communication systems; investigation of the hardness of GaAs ICs to total dose and transient ionizing radiation, and modelling of MESFET devices (this work carried out at North Carolina State University). Author (GRA)

N84-24980# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
LSI/VLSI (LARGE SCALE INTEGRATION/VERY LARGE SCALE INTEGRATION) ION IMPLANTED GaAs (GALLIUM ARSENIDE) IC PROCESSING. APPENDIX A: FEASIBILITY ANALYSIS OF GALLIUM-ARSENIDE MASK PROGRAMMABLE FUNCTIONS AND LOGIC ARRAYS FOR HIGH PERFORMANCE COMMUNICATIONS SYSTEMS Final Report, 25 Jul. 1980 - 30 Sep. 1982
R. R. Zucca, C. G. Kirkpatrick, P. M. Asbeck, F. H. Eisen, and C. P. Lee Jan. 1984 86 p
(Contract F49620-80-C-0101; ARPA Order 3384)
(AD-A139677; MRDC41070.25FR-APP-A; AFOSR-84-0230TR) Avail: NTIS HC A05/MF A01 CSCL 09/5

Circuits critical to the performance of advanced radio, radar and spread spectrum communications systems require advances in the state-of-the-art in semiconductor technology to meet the demands of advanced systems. As these systems increase in complexity, extensive digital circuitry is required in addition to the typical linear signal processing circuits. The power, size and weight of advanced systems also becomes unacceptable without continuous advances in semiconductor technology. Moreover an increasing trend is seen in the use of metal mask selectable functions, programmable logic arrays and gate arrays to implement system specific circuitry in an attempt to lower non-recurring costs, minimize risk and shorten development times. GaAs and other technologies with very high speed power-performance figures-of-merit are critical ingredients in systems implementations which satisfy these needs. To meet these advanced system requirements this project was initiated as a multi-phase/year program to develop a group of mask programmable gallium arsenide (GaAs) circuit elements applicable to high speed/performance communications systems. GRA

N84-24981# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
LSI/VLSI (LARGE SCALE INTEGRATION/VERY LARGE SCALE INTEGRATION) ION IMPLANTED GaAs (GALLIUM ARSENIDE) IC PROCESSING. APPENDIX B: TWO-DIMENSIONAL MODELING OF GaAs MESFET DEVICES FOR INTEGRATED HIGH-SPEED LOGIC CIRCUITS Final Report, 25 Jul. 1980 - 30 Sep. 1982
R. R. Zucca, C. G. Kirkpatrick, P. M. Asbeck, F. H. Eisen, and C. P. Lee Jan. 1984 130 p
(Contract F49620-80-C-0101; ARPA Order 3384)
(AD-A139678; MRDC41070.25FR-APP-B; AFOSR-84-0230TR) Avail: NTIS HC A07/MF A01 CSCL 09/5

This report summarizes the research carried out at North Carolina State University in support of the Rockwell International Program on LSI-VLSI Ion Implanted Planar GaAs IC Processing. The major thrust of the program at NCSU was to develop accurate computer models for analyzing the performance of short-channel GaAs MESFET devices as used in the Rockwell VLSI circuits.

The modeling research is divided into three parts: (1) Two-dimensional finite difference simulation, (2) Two-dimensional Monte Carlo analysis, and (3) Analytical modeling. The intent was to use the two-dimensional analyses to give exact solutions to the device operation and to serve as a guide for developing a simpler, and less expensive, analytical model of sufficient accuracy to be valuable as a design aid and to study effects of parameter changes. GRA

N84-24982# Range Commanders Council, White Sands Missile Range, N. Mex. Tele-communications Group.
DIGITAL MICROWAVE SYSTEM DESIGN GUIDE
Feb. 1984 273 p
(AD-A139738; RCC/TCG-207-84) Avail: NTIS HC A12/MF A01 CSCL 09/5

The purpose of this design guide is to provide a digital microwave system planning guide for use by digital microwave systems engineers at Department of Defense ranges. The objectives of this design are: (1) To furnish a guide for digital microwave system designs to be used by microwave engineers to implement a standardized approach to digital microwave systems for U.S. national ranges, and (2) To provide and maintain cognizance of applicable technical publications available by submitting on a timely basis those technical directives, standards, and references that impact on digital system design and may be included as an update to this planning document. Most of the telecommunications plants throughout the world have been built for analog transmission. In that mode, analog signals remain in analog form throughout the transmission process, while digital signals must be converted into a quasi-analog type signal. Digital transmission is the transfer of information by digital signals. GRA

N84-24983# Dikewood Corp., Albuquerque, N. Mex.
BOUNDING OF SIGNAL LEVELS AT TERMINATIONS OF A MULTICONDUCTOR TRANSMISSION-LINE NETWORK Final Report, Jun. 1982 - Apr. 1983
A. K. Agrawal Feb. 1984 155 p
(Contract F29601-82-C-0027; AF Proj. 3763)
(AD-A139757; DC-FR-1026.230-1; AFWL-TR-83-103) Avail: NTIS HC A08/MF A01 CSCL 09/1

Starting from the norm concept for vectors and matrices, this report addresses the problem of bounding signal levels at terminations of a multiconductor transmission-line network. The overall network equation is formulated in terms of the combined voltage supervector (a special combination of the voltage and current vectors). Utilizing the scattering and propagation supermatrices for the waves on the transmission-line network and the combined voltage supervector for sources, the BLT equation is used to express the combined voltage supervectors and the voltage and current supervectors at the junctions. The upper and lower bounds for the combined voltage supervector, voltage supervector and current supervector are obtained in terms of the norms of the propagation and scattering supermatrices and the norms of the combined voltage source supervector. Various properties of the propagation and scattering supermatrices are discussed for two cases, namely a uniform section of a multiconductor transmission line and a multiconductor transmission line with a branch. The expersions for upper and lower bounds for combined voltage supervectors and voltage and current supervectors are derived. Various forms of vectors, matrices, supervectors, and supermatrices are also discussed. Author (GRA)

N84-24984# Harry Diamond Labs., Adelphi, Md.
SPECTRAL POWER DENSITY EXTREMA FOR MICROWAVE EMISSION FROM A RELATIVISTIC REFLEX TRIODE
M. J. Smith Feb. 1984 29 p
(AD-A139771; HDL-TR-2029) Avail: NTIS HC A03/MF A01 CSCL 09/1

Spectral power density extrema are investigated for variable frequency and fixed beam radius, for variable beam radius and fixed frequency, and for both variable frequency and beam radius in the one-dimensional sheet model of the relativistic reflex triode. Approximate and exact formulations are given. A simple example is presented wherein the power spectrum exhibits gross features of the real situation. The extrema are seen to be closely related to the zeros of Bessel functions of the first kind or to zeros of equations involving both these Bessel functions and the Fourier-transformed current. Author (GRA)

N84-24985# Illinois Univ., Urbana. Dept. of Electrical Engineering.
INVESTIGATION OF CHARGE COUPLED DEVICES FOR SIGNAL PROCESSING Final Technical Report, 1 Jan. 1981 - 30 Sep. 1983
C. T. Sah Griffiss AFB, N.Y. RADC Feb. 1984 18 p
(Contract F19628-81-K-0016; AF Proj. 2305)
(AD-A139820; K-0016-SR-2-TR-55; RADC-TR-83-305) Avail: NTIS HC A02/MF A01 CSCL 09/5

New constant capacitance voltage transient methods are developed. Traps from ion implantation damage are profiled and characterized. New methods of determination of both majority and minority carrier capture rates at traps in one diode is developed. Two-dimensional numerical analyses with new boundary equations are demonstrated for micron and submicron silicon MOS devices. Dangling bound and hydrogen bonding of interface states and bulk dopant acceptor (boron) traps are experimentally demonstrated. Author (GRA)

N84-24986# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
LOW POWER RADIATION HARD GaAs RAM Semiannual Technical Report, 10 Jun. 1982 - 9 Dec. 1983
C. G. Kirkpatrick and R. P. Vahrenkamp Mar. 1984 35 p
(Contract MDA903-83-C-0067; ARPA Order 4100)
(AD-A139930; MRDC41131.6SA) Avail: NTIS HC A03/MF A01 CSCL 09/5

The scope of this program is to demonstrate a 1K GaAs static RAM having very low power dissipation, 1 micro W/bit in standby, and a short access time, 10 ns, to meet the requirements of the DARPA Advanced On-Board Signal Processor (AOSP). In the six month period covered by this report the initial processing of the 1K RAM arrays was begun. Testing of several lots revealed a mask error which is currently being corrected. The isolation studies for ultra-low power devices continued with major emphasis on isolation degradation following the Schottky metal process. A theoretical formulation for the leakage behavior of GaAs substrates was initiated, and good agreement between theory and the experimental data was obtained. Upset measurements have been made on a number of 256 bit RAMs using an Am-241 alpha particle source. The numerical value for the failure cross section was found to be similar in magnitude to the area of the Schottky barrier speed-up capacitor, suggesting that the capacitor is primarily responsible for the magnitude of the upset cross section. Single event upset measurements have also been carried out using 40 meV/protons at the NRL cyclotron facility. The results for this case also demonstrated a lower upset cross section for RAMs fabricated without the n(-) layer in the speed-up capacitor. A conceptual design of a new RAM mask set was begun in order to evaluate a wider range of RAM cell configurations. Both 256 and 1K bit arrays are being considered, and emphasis will be placed both on cell designs for enhanced yield and radiation hardness. Enhancement/depletion devices will also be incorporated into the design. Author (GRA)

N84-24987# Lincoln Lab., Mass. Inst. of Tech., Lexington.
RESTRUCTURABLE VLSI PROGRAM Semiannual Technical Summary Report, 1 Apr. - 30 Sep. 1983
P. E. Blankenship 30 Sep. 1983 41 p
(Contract F19628-80-C-0002; ARPA Order 3797)
(AD-A139959; ESD-TR-83-104) Avail: NTIS HC A03/MF A01 CSCL 09/5

The main objective of the Lincoln Restructurable VLSI Program (RVLSI) is to develop design methodologies, architectures, design aids and testing strategies for implementing wafer-scale systems with complexities approaching a million gates. In our approach, we envisage a modular style of architecture comprising

an array of cells embedded in a regular interconnection matrix. Ideally, the cells should consist of only a few basic types. The interconnection matrix is a fixed pattern of metal lines augmented by a complement of programmable switches or links. Conceptually, the links could be either volatile or nonvolatile. They could be of an electronic nature, such as a transistor switch, or could be permanently programmed through some mechanism such as a laser. The RVLSI Program is currently focusing on laser-formed interconnect. GRA

N84-24988# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
HOW TO ASSEMBLE TREE MACHINES Interim Research Report
S. N. Bhatt and C. E. Leiserson 24 Feb. 1984 22 p
(Contract N00014-80-C-0622)
(AD-A139963; MIT/LCS/TM-255) Avail: NTIS HC A02/MF A01 CSCL 09/1

Many researchers have proposed that ensembles of processing elements be organized as trees. This paper explores how large tree machines can be assembled efficiently from smaller components. A principal constraint considered is the limited number of external connections from an integrated circuit chip. We also explore the emerging capability of restructurable VLSI which allows a chip to be customized after fabrication. The authors give a linear-area chip of m processors and only four off-chip connections which can be used as the sole building block to construct an arbitrarily large complete binary tree. They also present a restructurable linear-area layout of m processors with O(lg m) pins that can realize an arbitrary binary tree of any size. This layout is based on a solution to the graph-theoretic problem: Given a tree in which each vertex is either black or white, determine how many edges need be cut in order to bisect the tree into equal-size components, each containing exactly half the black and half of the white vertices. These ideas extend to more general graphs using separator theorems or bifurcators. Author (GRA)

N84-24989# Naval Civil Engineering Lab., Port Hueneme, Calif.
FIELD DEMONSTRATION OF THREE-PHASE WANLASS MOTORS Final Report, Aug. 1981 - Apr. 1983
G. Dann Jan. 1984 97 p
(AD-A140085; NCEL-TN-1686) Avail: NTIS HC A05/MF A01 CSCL 10/2

Electric motors are a major part of the load at Naval shore facilities. The Naval Civil Engineering Laboratory (NCEL) investigated the Wanlass motor as a means of reducing power consumption, reducing current flow, and improving power factor, as compared to standard motors. NCEL surveyed the literature on single-phase and poly-phase Wanlass motors and tested poly-phase Wanlass motors. Efficiency, current, power factor, load sharing, temperature rise, vibration and noise, torque-speed, and reliability were judged. A reduction in current flow and a corresponding improvement in power factor can be expected with the Wanlass rewind. A small improvement in efficiency - a reduction in power consumption - is possible but not certain. It was recommended that Wanlass rewinds not be purchased on the basis of energy savings or power factor improvement.
Author (GRA)

N84-24990# University of Southern Mississippi, Hattiesburg.
THIAZINE DYES FOR USE IN PHOTOGALVANIC CELLS M.S. Thesis
Willie Charles Burton May 1981 84 p refs
(Grant DE-FG02-79ER-10534)
(DE84-009097; DOE/ER-10534/T1) Avail: NTIS HC A05/MF A01

The problem of self association of the dye in a photogalvanic cell is examined. As seen in the case of one dye, it could not be eliminated by merely attaching hydrophilic groups to the phenothiazinium chromophore. Another dye appears to offer some hope of resolving both problems since it is almost completely miscible with water and shows very little aggregation at high concentration. The problem of irreversible photobleaching of the dye solution will impede its use in the cell. M.A.C.

N84-24991# University of Southern Mississippi, Hattiesburg. Dept. of Chemistry.
PHOTOGALVANIC CELLS DRIVEN BY ELECTRON TRANSFER QUENCHING OF EXCITED SINGLET STATES Final Technical Report, 1 Sep. 1979 - 28 Feb. 1983
David Creed and Newton C. Fawcett 1983 43 p refs
(Grant DE-FG02-79ER-10534)
(DE84-009099; DOE/ER-10534/3) Avail: NTIS HC A03/MF A01

Photoreduction of oxonine by iron(II) sulfate in dilute acid is produced by quenching of the excited signlet state (S1). No induced intersystem crossing to the tripolet (T1) is observed by nanosecond flash photolysis. The photoreduction of oxonine (S1) by iron(II) was used in a totally illuminated thin layer photogalvanic cell. Power conversion efficiencies are, however, very low. The fluorescence of oxonine and thiazine dyes such as thionine is quenched by acids. Oxonine fluorescence is also quenched by hydroquinone and catechol sulfonates and related compounds. Eleven new thiazine dyes were synthesized. A few photogalvanic experiments were carried out using high concentrations of the water miscible dye and iron(II) in a TI/TL cell. Ferrophos, an iron phosphorus alloy, can be substituted for platinum or gold as a cathode in photogalvanic cells. DOE

N84-24992# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
IMPROVED COMPUTER MODELLING OF MAGNETRON INJECTION GUNS FOR GYROTRONS
M. Caplan and C. Thorington 1984 25 p refs
(Contract W-7405-eng-26)
(DE84-007536; DOE/NBM-4007536) Avail: NTIS HC A02/MF A01

A variable mesh finite element electron gun design code was developed to simulate hollow beams produced by magnetron injection guns. Very accurate solutions of the self consistent space charge forces are obtained by using a computational mesh, distorted in a way which allows a high density of mesh points within the hollow beam. A generalized hybrid model for cathode emission has been incorporated which combines temperature limited and space charge limited emission in a way justified from empirical and physical arguments. Beam characteristics of a magnetron injection gun are presented as the transition from temperature limited to space charge limited operation is made. Comparisons with experimental results are presented. DOE

N84-24993# Merlin Gerin, Grenoble (France). Service Information.
ROTATING ARC CUTOFF WITH A FLUARC SWITCH OR A ROLLARC CONTACTOR IN SF6 [LE PROCESSUS DE COUPURE AVEC UN DISJONCTEUR FLUARC OU UN CONTACTEUR ROLLARC PAR ARC TOURNANT DANS LE SF6]
Christophe Duplay May 1983 11 p refs In FRENCH
(Cahiers-Techniques-123) Avail: NTIS HC A02/MF A01

The principles of rotating arc cutoff are reviewed, and applications to circuit breakers and contactors are indicated. The Rollarc (trademark) contactor offers high cutoff power (10 KA at 7.2 KV) and an extremely low level of overvoltage. The Fluorarc (trademark) circuit breaker is similar to the Rollarc, using a magnetic coil to shift the arc, but uses knife switches which are separated from the coil/arc assembly. Fluorarc is sealed for life, and requires no maintenance. Author (ESA)

N84-24994# Merlin Gerin, Grenoble (France). Service Information.
GUIDE FOR DESIGNING INDUSTRIAL HIGH TENSION NETWORKS [GUIDE POUR LA CONCEPTION DES RESEAUX INDUSTRIELS HT]
Michel Dana Jun. 1983 15 p refs In FRENCH
(Cahiers-Techniques-124) Avail: NTIS HC A02/MF A01

Safety and reliability factors influencing the design of 3 to 30 KV industrial networks are reviewed. Design rules for motors,

transformers, distribution networks, a power supply, dynamic stability, linkup with an outside network, power distribution, and automation are suggested. Author (ESA)

N84-24995# Merlin Gerin, Grenoble (France). Service Information.
CONTROL FO SWITCHING INDUCED SURGES USING SF6 DEVICES [LA MAITRISE DES SURTENSIONS DE MANOEUVRE AVEC LES APPAREILS SF6]
Olivier Bouilliez Sep. 1983 15 p refs In FRENCH
(Cahiers-Techniques-125) Avail: NTIS HC A02/MF A01

Transient surges in medium voltage networks when receiver voltage is reduced, or cut off, are discussed. The use of SF6 circuit breakers to limit these surges in motors and transformers is described. Tests indicated that SF6 devices can be used without other protection (inductance coils, condensers) even in sealed units. Author (ESA)

N84-24996# Merlin Gerin, Grenoble (France). Service Information.
SELECTIVITY OF LOW TENSION CIRCUIT PROTECTION: THE SELLIM SYSTEM [SELECTIVITE DES PROTECTIONS EN BT: LE SYSTEME SELLIM]
Camille Albertin Jun. 1983 11 p refs In FRENCH
(Cahiers-Techniques-126) Avail: NTIS HC A02/MF A01

A circuit protection system which combined total selectivity and high limitation of short circuit currents without complicated switch design or setting is described. An ultralimiter circuit breaker (D1) was installed ahead of another switch (D2). Switch D1 did not break the circuit when the first fault wave appeared, but opened temporarily to allow D2 to eliminate the short circuit and to reestablish service after 10 msec. If the fault occurred between D1 and D2, a second fault wave occurred, and D1 operated as a circuit breaker. Author (ESA)

N84-25086*# General Electric Co., Philadelphia, Pa. Space Systems Operations Div.
IMPROVING SLIPRING PERFORMANCE
Donald N. Matteo *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 111-130 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 09A

N84-25096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SMART MOTOR TECHNOLOGY
D. Packard and D. Schmitt (Lockheed Missiles and Space Co.) *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 301-318 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-24997# National Aerospace Lab., Tokyo (Japan).
AN EXPERIMENTAL AND ANALYTICAL STUDY OF SPRAY FLOW FIELDS FORMED BY LIQUID/GAS COAXIAL INJECTOR ELEMENTS
Nobuyuki Yatsuyanagi 1982 89 p refs In JAPANESE; ENGLISH summary
(NAL-TR-745; ISSN-0389-4010) Avail: NTIS HC A05/MF A01

An experimental and analytical study of the spray flow formed by recessed post concentric-tube injector elements is presented. The recessed post elements exhibited good mixing efficiencies between the liquid droplets and the phase, compared to the flush-face elements. And the coefficient k, which is the ratio of the half-width of liquid-phase mass flux to that of the gas-phase velocity, was proved to be the analogous Schmidt number of the spray, if it was considered to have the average density of a two-phase flow. The analytical method which was derived was applied to calculate the two-phase jet flow field under the conditions of experiments which had reported in the literature. The agreements between the analytical solutions and the experimental data are good. Several analytical models in the literature, which assumed no relative velocity between the gas-phase and the liquid-droplets, were proved to be inadequate except in the case where the liquid injection mass fraction was very small and the liquid droplet diameter was on the order of 10 microns. M.G.

N84-24998# Polish Academy of Sciences, Warsaw. Inst. of Fundamental Technological Research.
STABILITY OF FLOW PROCESSES FOR DISSIPATIVE SOLIDS WITH INTERNAL IMPERFECTIONS
Piotr Perzyna 1983 67 p refs
(ISSN-0208-5658) Avail: NTIS HC A04/MF A01

The onset of the instability of flow process for dissipative bodies with internal imperfections was studied. Formulation of a quasi-static, isothermal flow process for a bounded body is given. Criteria of localization of plastic deformations are considered. The postcritical behavior for dissipative solids is described by a very precise constitutive model and important cooperative effects such as internal imperfections, strain rate sensitivity, etc., are taken into consideration. The constitutive modelling is developed within the framework of two material structures, namely the internal state variable and rate type material structures. The influence of internal imperfections and transport phenomena governing the evolution of imperfections in time and its distributions in a body during the flow process are described. Physical and experimental motivations for these effects are given and theoretical proposition describing the nucleation, growth and diffusion of voids is presented. Author

N84-24999*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A REVIEW OF INTERNAL COMBUSTION ENGINE COMBUSTION CHAMBER PROCESS STUDIES AT NASA LEWIS RESEARCH CENTER
Harold J. Schock 1984 12 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME
(NASA-TM-83666; E-2085; NAS 1.15:83666) Avail: NTIS HC A02/MF A01 CSCL 20D

The performance of internal combustion stratified-charge engines is highly dependent on the in-cylinder fuel-air mixing processes occurring in these engines. Current research concerning the in-cylinder airflow characteristics of rotary and piston engines is presented. Results showing the output of multidimensional models, laser velocimetry measurements and the application of a holographic optical element are described. Models which simulate the four-stroke cycle and seal dynamics of rotary engines are also discussed. R.S.F.

N84-25000*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTATIONAL MODELING OF JET INDUCED MIXING OF CRYOGENIC PROPELLANTS IN LOW-G
J. I. Hochstein (Akron Univ.), P. M. Gerhart (Akron Univ.), and J. C. Aydelot May 1984 13 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME
(Grant NAG3-318)
(NASA-TM-83703; E-2161; NAS 1.15:83703; AIAA-84-1344) Avail: NTIS HC A02/MF A01 CSCL 20D

The SOLA-ECLIPSE Code is being developed to enable computational prediction of jet induced mixing in cryogenic propellant tanks in a low-gravity environment. Velocity fields, predicted for scale model tanks, are presented which compare favorably with the available experimental data. A full scale liquid hydrogen tank for a typical Orbit Transfer Vehicle is analyzed with

the conclusion that coupling an axial mixing jet with a thermodynamic vent system appears to be a viable concept for the control of tank pressure. Author

N84-25001*# Pennsylvania State Univ., State College. Applied Research Lab.
THE BOUNDARY LAYER ON COMPRESSOR CASCADE BLADES Semiannual Progress Report, 1 Dec. 1983 - 1 Jun. 1984
Steven Deutsch and William C. Zierke 1984 76 p refs
(Grant NsG-3264)
(NASA-CR-173514; NAS 1.26:173514) Avail: NTIS HC A05/MF A01 CSCL 20D

The characteristics of the flow field about highly loaded turbocompressor blades in a cascade wind tunnel were investigated. Experimental tests were conducted at chord Reynolds number (R sub c) near 500,000. A laser Doppler anemometer was employed in flow velocity measurement. Suction surface mean velocity and turbulence intensity profiles at a single incidence angle are presented. These data contribute to further understanding of two-dimensional boundary layer profiles, points of separation, and transition zones for turbomachine blades, and concomitantly, to compressor cascade predictive models. R.S.F.

N84-25002*# Wales Univ., Swansea.
HIGH SPEED INVISCID COMPRESSIBLE FLOW BY THE FINITE ELEMENT METHOD
O. C. Zienkiewicz, R. Loehner, and K. Morgan May 1984 23 p refs Presented at the 5th MAFELAP Conf., Middlesex, England, 1-4 May 1984
(Contract NAGw-478)
(NASA-CR-173556; NAS 1.26:173556; C/R/477/84) Avail: NTIS HC A02/MF A01 CSCL 20D

The finite element method and an explicit time stepping algorithm which is based on Taylor-Galerkin schemes with an appropriate artificial viscosity is combined with an automatic mesh refinement process which is designed to produce accurate steady state solutions to problems of inviscid compressible flow in two dimensions. The results of two test problems are included which demonstrate the excellent performance characteristics of the proposed procedures. A.R.H.

N84-25003# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
CHANGES OF PHASE AND WAVES ON DEPRESSURIZATION OF LIQUIDS WITH HIGH SPECIFIC HEAT
Humberto Chaves 1984 97 p refs In GERMAN; ENGLISH summary
(MPIS-Mitt-77; ISSN-0347-1257) Avail: NTIS HC A05/MF A01

Adiabatic expansion experiments are carried out in a duct of constant cross section using a substance of high specific heat. In the case of a quick depressurization the phase change is coupled to superheat of the liquid and to differing wave speeds in the liquid and in the two phase mixture. This difference causes a splitting of a wave running into liquid in a fast forerunner wave and a slow evaporation wave, in which part of the phase change takes place. this wave-splitting is observed in the experiments. A correspondence is found between the measurements and the calculations of the pressure levels for the sonic state and for the transition from mixture to gas flow. A comparison between the results obtained with a duct of constant cross-section and those with a duct of diverging cross section, shows that wave spliting is a purely local thermodynamic phenomenon and is independent of geometry. M.A.C.

N84-25004# National Aerospace Lab., Amsterdam (Netherlands). Space Flight Div.
PRELIMINARY EXPERIMENTS WITH AN ELECTRO-OSMOTIC HEAT PIPE LABORATORY MODEL
D. vandenAssen and P. B. Bunk 6 Apr. 1983 38 p refs
(Contract NIVR-1833)
(AD-B081344; NLR-TR-83041-U) Avail: NTIS HC A03/MF A01

A laboratory model of an electro-osmotic heat pipe filled with ethanol was tested. The heat transport through the pipe and the temperature distribution along the pipe wall and the temperature difference across the pipe were measured. The heat pipe performed like a CCHP under wick limited operation conditions. Superheating of the ethanol in the evaporator caused relatively large variations of the heat transport. With the electro-osmotic pump in operation, the heat pipe showed a fast gas production and corrosion of the electrodes of the electro-osmotic pump, whereas no measurable effect on the heat transport was observed. E.A.K.

N84-25005# Bristol Univ. (England). Dept. of Aeronautical Engineering.
THE FILLING EFFECT OF BLOCKAGES IN WIDE ANGLE DIFFUSERS B.S. Thesis
C. P. Gibbs and D. Latimer Jun. 1983 47 p refs
(BU-284) Avail: NTIS HC A03/MF A01

Filling of the velocity profile at the exit of diffusers caused by a blockage placed at the diffuser exit plane was investigated. Diffusers tested had total included angles of 15 deg, 30 deg, 45 deg and 180 deg and were of area ratios 2 and 3.5. The Reynolds number at the diffuser entry was 6.6 x 10 to the 4th power. Significant filling was measured for diffusers with a total included angle of 30 deg or greater, accompanied by an increase in static pressure recovery. It was shown that the flow behind the blockage had large spanwise pressure gradients which caused divergent flow and filling. It is suggested that heat exchangers within which nonaxial flow of cooling air is possible are likely to be more efficient. E.A.K.

N84-25006# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.
CALCULATIONS OF INTERMITTENCY IN SELF-PRESERVING, FREE TURBULENT JETS AND WAKES
M. R. Malin Dec. 1983 66 p refs
(CFD/83/10) Avail: NTIS HC A04/MF A01

The performance of a k-epsilon version of the intermittency model of turbulence when used to predict the self preserving axisymmetric jet, plane jet and plane wake was examined. Predictions are made of the velocity variables within the turbulent and irrotational zones; the turbulent kinetic energy and its dissipation rate within the turbulent zone; and the intermittency factor. E.A.K.

N84-25007# New York Univ., New York.
KINETIC THEORY OF GASES, MAGNETO-FLUID DYNAMICS AND THEIR APPLICATION Interim Technical Report, 1 Dec. 1982 - 30 Nov. 1983
H. Grad 20 Jan. 1984 16 p
(Grant AF-AFOSR-0020-81; AF Proj. 2304)
(AD-A139616; AFOSR-84-0184TR) Avail: NTIS HC A02/MF A01 CSCL 20/4

The areas covered in this report are: (1) mathematical theory of queer differential equations; (2) universal solutions in multidimensional diffusion equations; (3) exact integrals of the Emden-Fowler equation; (4) new results in the theory of turbulent self-diffusion; and (5) mathematical theory of the essential spectrum in magnetohydrodynamics. Author (GRA)

N84-25008# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
A SECOND ORDER UPWIND FLUX METHOD FOR HYPERBOLIC CONSERVATION LAWS Final Report
B. E. McDonald Nov. 1983 25 p
(AD-A139769; NORDA-57) Avail: NTIS HC A02/MF A01 CSCL 20/4

We present first- and second-order upwind schemes employing a numerically calculated characteristic speed direction and combine them into a simple monotonicity preserving hybrid scheme using the method of flux correction. The first-order scheme is constructed to maintain accuracy at flow reversal points. The hybrid scheme computes a provisional update from the first-order scheme, and then filters the second-order corrections to prevent occurrence of new extrema. We derive analytic solutions for a developing N-wave

shock, and compare computed versus analytic results for two different N waves and for a third case involving linear advection of a square wave. Results are given with and without the second-order correction. The second-order results are always superior to first-order results, with the most dramatic difference occurring for the case of linear advection. The results suggest that higher order differences could be substituted in the hybrid scheme to reduce truncation error even further. GRA

N84-25009# Naval Ship Research and Development Center, Bethesda, Md.
A FINITE ELEMENT METHOD FOR THE GAS DYNAMICS EQUATIONS IN 2 DIMENSIONS AND IN CONSERVATION FORM
M. C. Mosher Mar. 1984 23 p
(AD-A139774; DTNSRDC-83/067) Avail: NTIS HC A02/MF A01 CSCL 20/4

A linear finite element method for the gas dynamics equations in two dimensions, in conservation form and with a numerical viscosity, is described. Series representations of the integrals of rational functions produced by the conservation form that are suitable for numerical computation are derived. The numerical viscosity is used to smear out shocks. The ordinary differential equations of the method can be integrated by any packaged program designed for systems with a mass matrix. The series representations of the integrals can be used by moving node finite element methods. Author (GRA)

N84-25010# Defence Research Establishment Suffield, Ralston (Alberta).
MEASUREMENTS OF ELONGATIONAL VISCOMETRY USING A FIBER SPINNING TECHNIQUE. PART 1: MODIFICATIONS TO THE SANGAMO SCHLUMBERGER ELONGATIONAL VISCOMETER MODEL E4
M. D. Gauthier Mayer, W. J. Fenrick, and S. J. Armour Feb. 1984 47 p
(AD-A140002; DRES-SR-377) Avail: NTIS HC A03/MF A01 CSCL 20/4

The Sangamo-Schlumberger Elongational Viscometer (Model E4), as delivered by the manufacturer, did not maintain a constant elongational load under constant flow conditions and consequently could not be used to accurately measure elongational viscosity. The extensive modifications made to the instrument at DRES to correct this problem are described in detail as are other improvements made to the instrument. GRA

N84-25011# Oak Ridge National Lab., Tenn. Energy Div.
OVERVIEW OF DOE-SPONSORED HEAT PUMP RESEARCH
P. D. Fairchild 1984 9 p refs Presented at a Seminar on Heat Pumps: An Update on Res. and Appl., New Orleans, 23-24 Feb. 1984; sponsored by EPRI
(Contract W-7405-eng-26)
(DE84-007561; CONF-840266-1) Avail: NTIS HC A02/MF A01

Research activities related to residential and commercial heat pump technology are reported. The following topics are discussed: program size and research emphasis, design analysis and optimization, dynamic loss phenomena, heat pump capacity modulation, ground coupled heat pump technology, nonazeotropic refrigerant mixtures, and future research areas. DOE

N84-25012# Argonne National Lab., Ill.
FLUID FORCES ON A RIGID CYLINDER IN TURBULENT CROSSFLOW
T. M. Mulcahy 1984 14 p refs Presented at the ASME Winter Ann. Meeting, New Orleans, 9 Dec. 1984
(Contract W-31-109-eng-38)
(DE84-006364; CONF-841201-5) Avail: NTIS HC A02/MF A01

Fluctuating lift and drag, and steady drag force coefficients are presented which were obtained in water flows with Reynolds numbers in the range 3 x 10(4) to 2 x 10(5). Turbulence intensities were varied from 1.5 to 15% while integral scale lengths ranged from 0.5 to 2 tube diameters. The turbulence generated is described and the method of force measurement is outlined. Empirical bounds on the force spectra are given, and available information on spanwise correlation lengths are identified so that the data can be used to make RMS vibration response predictions where fluid structure interaction does not occur. DOE

N84-25013# Massachusetts Inst. of Tech., Cambridge.
CONICAL FLOWS WITH LEADING EDGE VORTICES
Eric Serge Perez and Kenneth Grant Powell [1984] 31 p
Avail: NTIS HC A03/MF A01

View graphs show possible leading edge vortex flow patterns. An approach is presented for solving the problem which includes finite volume approximation, smoothing, shock fitting, and the body boundary conditions. The axisymmetric case and small and larger angles of attack are considered. A.R.H.

N84-24651*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
CASCADE VARIABLE-CONDUCTANCE HEAT PIPE (A0076)
Michael G. Grote and Leslie D. Calhoun, II *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 66-69 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20D

N84-24652*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW-TEMPERATURE HEAT PIPE EXPERIMENT PACKAGE (HEPP) FOR LDEF (S1001)
Roy McIntosh, Jr., Stanford Ollendorf, and Craig R. McCreight (NASA. Ames Research Center) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 70-73 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20D

N84-24653*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TRANSVERSE FLAT-PLATE HEAT PIPE EXPERIMENT (S1005)
James W. Owen and Fred Edelstein (Grumman Aerospace Corp.) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 74-77 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20D

N84-24744# Cranfield Inst. of Tech., Bedfordshire (England). School of Mechanical Engineering.
EFFECTS OF AIRBLAST ATOMIZER DESIGN UPON SPRAY QUALITY
A. K. Jasuja *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 14p refs Sponsored in part by U.K. Ministry of Defence (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24745# Karlsruhe Univ. (West Germany). Lehrstuhl und Inst. fuer Thermische Stroemungsmaschinen.
OPTICAL MEASUREMENTS OF DROPLET SIZE DISTRIBUTIONS: SPECIAL CONSIDERATIONS IN THE PARAMETER DEFINITION FOR FUEL ATOMIZERS
S. Wittig, M. Aigner, K. Sakbani, and T. Sattelmayer *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24746# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Antriebstechnik.
LIQUID FUEL ATOMIZATION AND MIXING IN A HIGH VELOCITY AIR STREAM
H. Eickhoff, D. Granser (Kraftwerk-Union), and W. Krockow (Kraftwerk-Union) *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 8p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24747*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DETAILED FUEL SPRAY ANALYSIS TECHNIQUES
Edward J. Mularz (AVRADCOM), Maria A. Bosque, and Frank M. Humenik *In* AGARD Combust. Probl. in Turoine Eng. Jan. 1984 10p refs Previously announced as N83-34943 (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01 CSCL 20D

N84-24748# Instituto Superior Tecnico, Lisbon (Portugal). Dept. Engenharia Mecanica.
DROPLET SIZE DISTRIBUTION AND LIQUID VOLUME CONCENTRATION IN A WATER SPRAY: PREDICTIONS AND MEASUREMENTS
Gabriel P. Pita *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 9p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24760# Middle East Technical Univ., Ankara (Turkey). Dept. of Chemical Engineering.
EVALUATION OF MULTI-DIMENSIONAL FLUX MODELS FOR RADIATIVE TRANSFER IN COMBUSTION CHAMBERS: A REVIEW
Nevin Selcuk *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24761# Middle East Technical Univ., Ankara (Turkey). Dept. of Mechanical Engineering.
A DROPLET EVAPORATION RATE CONTROLLED COMBUSTION MODEL
A. D. Bayka *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 12p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24762# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PREDICTION OF TURBULENT REACTIVE FLOW
Francis Dupoirieux *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 10p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24768# Sheffield Univ. (England). Dept. of Chemical Engineering and Fuel Technology.
PROBLEM INDEPENDENT NUMERICAL SIMULATION OF TWO-PHASE FLOW IN COMBUSTORS
W. H. Ayers, F. Boysan, B. C. R. Ewan, and J. Swithenbank *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 8p refs (For primary document see N84-24732 15-25)
Avail: NTIS HC A19/MF A01

N84-24836# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
SIMULATION OF HEAT TRANSFER AND FLUID FLOW IN THE SOLIDIFICATION OF ALLOYS Abstract Only
Harold D. Brody and Robert A. Stoehr *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 5 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24837# Illinois Univ., Urbana. Dept. of Mechanical Engineering.
FLUID FLOW IN LASER MELTED POOL Abstract Only
C. Chan, J. Mazumder, and M. M. Chen *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 6-7 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24881# Michigan Univ., Ann Arbor. Dept. of Mechanical Engineering.
PRESSURE INDUCED RADIAL DIFFUSION OF A FLUID THROUGH A THICK WALLED HIGHLY ELASTIC CYLINDER Abstract Only
A. S. Wineman, M. Gandhi, and D. R. Rajagopal (Pittsburgh Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 83 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24886# Lehigh Univ., Bethlehem, Pa.
THE STATUS OF THE SIMPLE FLUID Abstract Only
R. S. Rivlin *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 103-105 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24887# Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
GRAVITATIONAL INSTABILITY OF AN INTERFACE BETWEEN TWO SECOND-ORDER FLUIDS Abstract Only
David F. McTique *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 109 (For primary document see N84-24833 15-31)
(Contract DE-AC04-76DP-00789)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24888# Tennessee Univ., Knoxville. Dept. of Engineering Science and Mechanics.
A TENSOR CONSTITUTIVE EQUATION FOR TURBULENT FLOW Abstract Only
A. J. Baker *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 110-111 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24889# Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
TURBULENCE EFFECT ON LAMINAR SEPARATION ON A CIRCULAR CYLINDER Abstract Only
Willy Z. Sadeh, Daniel B. Saharon, and Peter P. Sullivan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 112-113 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24890# Pittsburgh Univ., Pa. Dept. of Mechanical Engineering.
FLOW BETWEEN ROTATING DISKS. PART 1: BASIC FLOW Abstract Only
S. J. Schneider, F. Labbe, H. N. Kaufman, and A. Z. Szeri *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 114-116 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24891# Pittsburgh Univ., Pa. Dept. of Mechanical Engineering.
FLOW BETWEEN ROTATING DISKS. PART 2: STABILITY Abstract Only
A. Giron, S. J. Schneider, H. N. Kaufman, and A. Z. Szeri *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 117-119 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24892# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
ON THE STRUCTURE OF ROTATIONAL INSTABILITIES IN NON-NEWTONIAN FLUIDS Abstract Only
Charles G. Speziale *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 120 refs Sponsored in part by the Exxon Education Foundation (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24893# Alabama Univ., University. Dept. of Engineering Mechanics.
FLOW AND FREE SURFACE OF A NON-NEWTONIAN FLUID

BETWEEN CONCENTRIC CYLINDERS MAINTAINED AT UNEQUAL TEMPERATURES Abstract Only
Aydeniz Siginer *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 121-122 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24903# Hawaii Univ., Honolulu. Dept. of Mechanical Engineering.
CONVECTIVE HEAT TRANSFER IN POROUS MEDIA Abstract Only
Ping Cheng *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 210-211 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

N84-24905# Pittsburgh Univ., Pa. Dept. of Mathematics and Statistics.
HIGH REYNOLDS NUMBER SOLUTIONS FOR INCOMPRESSIBLE VISCOUS FLOW USING THE REDUCED BASIS TECHNIQUE Abstract Only
Janet S. Peterson *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 249 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/4

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-25014# Japan Broadcasting Corp., Tokyo. Electron Devices Research Div.
DEVELOPMENT OF AUTOMATIC MEASURING SYSTEM FOR IMAGE PICKUP TUBES
Takashi Ando and Yakashi Yamashita Jan. 1984 12 p
(NHK-LN-295; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

Television camera tubes are usually assessed by measuring such parameters as amplitude response, time lag characteristics, and afterimage. The results of these measurements, however, vary according to the environmental or working conditions of the camera tube. Instruments employed in measuring camera tube parameters are described herein, and an automatic measuring system incorporating a central processing unit (CPU) is discussed. Through use of this automatic measuring system, data obtained can be stored for further analysis and data handling is made easier.
R.S.F.

N84-25015*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPINNING DISK CALIBRATION METHOD AND APPARATUS FOR LASER DOPPLER VELOCIMETER Patent Application
Philip K. Snyder, inventor (to NASA) Filed 19 Apr. 1984 18 p (NASA-Case-ARC-11510-1; US-Patent-Appl-SN-602049) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus for calibrating laser Doppler velocimeters having one or more intersecting beam pairs are described. These velocimeters measure fluid velocity by observing the light scattered by particles in the fluid stream. Moving fluid particulates are simulated by fine taut wires that are radially mounted on a disk that is rotated at a known velocity. The laser beam intersections locus is first aimed at the very center of the disk and then the disk is translated so that the locus is swept by the rotating wires. The radial distance traversed is precisely measured so that the velocity of the wires (pseudo particles) may be calculated.
NASA

N84-25016*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTISPECTRAL LINEAR ARRAY MULTIBAND SELECTION DEVICE Patent Application
Herbert L. Richard, inventor (to NASA) Filed 2 May 1984 14 p (NASA-Case-GSC-12911-1; US-Patent-Appl-SN-606426) Avail: NTIS HC A02/MF A01 CSCL 14B

An apparatus for detecting multiple spectral bands, individually or concurrently, using linear detector arrays is described. The system employs a beamsplitter to divide the optical source into two or more optical beams which are directed at the linear detector arrays. Filter trays are positioned in the focal planes of the optical beams so that the beams pass through the filter trays prior to impinging upon the detector arrays. Multiple filters are placed on the filter trays. Linear actuators, positioned adjacent the filter trays, translate the trays across the focal planes of the optical beams. Individual bandpass filters are positioned in the path of the incoming beams so that specific beam frequencies can be detected and further analyzed. This spectral detection method can be applied in spaceborne and aerial imaging procedures.
NASA

N84-25017*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOLOGRAPHIC AIDS FOR INTERNAL COMBUSTION ENGINE FLOW STUDIES
Carolyn Regan 1984 12 p refs Presented at the 7th Intern. Conf. of Women Engr. and Scientists, Washington, 17-24 Jun. 1984
(NASA-TM-83681; E-2070; NAS 1.15:83681) Avail: NTIS HC A02/MF A01 CSCL 14E

Worldwide interest in improving the fuel efficiency of internal combustion (I.C.) engines has sparked research efforts designed to learn more about the flow processes of these engines. The flow fields must be understood prior to fuel injection in order to design efficient valves, piston geometries, and fuel injectors. Knowledge of the flow field is also necessary to determine the heat transfer to combustion chamber surfaces. Computational codes can predict velocity and turbulence patterns, but experimental verification is mandatory to justify their basic assumptions. Due to their nonintrusive nature, optical methods are ideally suited to provide the necessary velocity verification data. Optical sytems such as Schlieren photography, laser velocimetry, and illuminated particle visualization are used in I.C. engines, and now their versatility is improved by employing holography. These holographically enhanced optical techniques are described with emphasis on their applications in I.C. engines.
Author

N84-25018*# Precision Devices Ltd., Huntsville, Ala.
DESIGN AND CONSTRUCTION OF EQUIPMENT ITEMS FOR GEOPHYSICAL FLUID FLOW MODELS Final Report
O. C. Holderer 29 Mar. 1984 25 p
(Contract NAS8-35023)
(NASA-CR-171017; NAS 1.26:171017) Avail: NTIS HC A02/MF A01 CSCL 14B

The design and development of a thermometer well, a thermistor probe, conducting sidewalls, precision controllers, and a baroclinic chamber are described. Engineering drawings are included.
A.R.H.

N84-25019*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OPTIMIZATION OF FRINGE-TYPE LASER ANEMOMETERS FOR TURBINE ENGINE COMPONENT TESTING
Richard G. Seasholtz, Lawrence G. Oberle, and Donald H. Weikle 1984 16 p refs Presented at the 20th Joint Propulsion Conf., Cincinnati, 11-13 Jun. 1984; sponsored by AIAA, SAE and ASME (NASA-TM-83658; E-2099; NAS 1.15:83658; AIAA-84-1459) Avail: NTIS HC A02/MF A01 CSCL 14B

The fringe type laser anemometer is analyzed using the Cramer-Rao bound for the variance of the estimate of the Doppler frequency as a figure of merit. Mie scattering theory is used to calculate the Doppler signal wherein both the amplitude and phase of the scattered light are taken into account. The noise from wall

scatter is calculated using the wall bidirectional reflectivity and the irradiance of the incident beams. A procedure is described to determine the optimum aperture mask for the probe volume located a given distance from a wall. The expected performance of counter type processors is also discussed in relation to the Cramer-Rao bound. Numerical examples are presented for a coaxial backscatter anemometer. Author

N84-25020*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OPTICAL MEASUREMENTS OF FLUCTUATING TEMPERATURES IN A SUPERSONIC TURBULENT FLOW USING ONE- AND TWO-PHOTON, LASER-INDUCED FLUORESCENCE
Kenneth P. Gross (Polyatomics Research Inst.) and Robert L. McKenzie May 1984 9 p refs
(NASA-TM-85949; A-9724; NAS 1.15:85949) Avail: NTIS HC A02/MF A01 CSCL 14B

A laser-induced fluorescence technique was developed that provides a practical means of nonintrusively measuring the instantaneous temperatures in low-temperature turbulent flows. The capabilities of the method are reviewed, and its application to a simple, two-dimensional, turbulent boundary-layer flow at Mach 2 is reported. Measurements of the average temperature distribution through the boundary layer and the magnitudes of temperature fluctuations about their average values are presented. M.G.

N84-25021# Technical Research Centre of Finland, Espoo. Metallab.
COMPARISON OF THE FORCE SCALE UP TO 1 MN BETWEEN THE PHYSIKALISCH-TECHNISCHEN BUNDESANSTALT (PTB), WEST GERMANY AND THE TECHNICAL RESEARCH CENTRE OF FINLAND (VTT)
Manfred Peters (Physikalisch-Technische Bundesanstalt, Brunswick) and Heikki Leinonen Oct. 1983 64 p refs
(VTT-229; ISBN-951-38-1891-8; ISSN-0358-5077) Avail: NTIS HC A04/MF A01; Technical Research Centre of Finland, Espoo, FIM 35

Force standards and the force measurement methods were compared. The force measurement devices and methods are described and the results and problems of the force transducers are discussed. The effects of loading and unloading creep, changes in zero point and in sensitivity on the short and long term behavior of the force transducers are presented. E.A.K.

N84-25022# Fachhochschule, Aachen (West Germany). Fachbereich Maschinenbau/Konstruktionstechnik Stroemungslabor.
DEVELOPMENT OF A SIMPLE WIND SPEEDOMETER FOR APPLICATION IN COUNTRIES OF THE DEVELOPING WORLD Final Report, Mar. 1982
Reinhard Grundmann, Willi Hallmann, and Horst Schaefer Bonn Bundesminsterium fuer Forschung und Technologie Dec. 1983 137 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-310; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 29

The development of a wind measuring apparatus (WMA), which will record wind energy respectively wind power over longer periods is outlined. On the basis of the measurement data a decision can be made for the location of a wind mill generator. A favorably priced WMA was developed which will yield the following data: (1) device specific wind energy; (2) equivalent average wind velocity; and (3) equivalent average wind power. The device uses a constant breaking torque which can be adjusted so that measurements will only start at a predetermined minimum wind velocity. A mechanically operating switch can be installed which will interrupt the recording at a present maximum wind velocity. The apparatus has favorable manufacturing costs and the mechanically operating device is independent of an external energy source. E.A.K.

N84-25023# Research Inst. of National Defence, Stockholm (Sweden).
TEST OF A SYSTEM FOR POSITIONING: SENSITRON
Sven Modig Nov. 1983 47 p In SWEDISH; ENGLISH summary
(FOA-C-20519-D8; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

The possibilities of buying a system for positioning were investigated. Such a system was tested. The system is made for tracing individual animals within an area of a few square kilometers. An average difference between measured and true position, it is concluded that vector of 59 m length and a very unequal standard deviation is shown. The system does not seem suitable in its current conditions to be used. E.A.K.

N84-25024# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
COLD REGIONS INSTRUMENTATION CONSIDERATIONS
Mar. 1984 10 p
(AD-A139805; TOP-1-1-004) Avail: NTIS HC A02/MF A01 CSCL 14/2

Background information concerning problems associated with instrumentation, video and photography required for cold regions testing is provided. General environmental effects, equipment safeguards, data accuracy, and human factors are discussed. Procedures for maintenance of batteries and preparation of photographic equipment for cold regions use are provided. The information is applicable to all instrumentation used under cold regions conditions. GRA

N84-25025# Maryland Univ., College Park. Center for Automation Research.
EVIDENCE ACCUMULATION FOR SPATIAL REASONING IN AERIAL IMAGE UNDERSTANDING
V. S. S. Hwang, T. Matsuyama, L. S. Davis, and A. Rosenfeld Oct. 1983 39 p
(Contract F49620-83-C-0082; AF Proj. 2304)
(AD-A139874; CAR-TR-28; CS-TR-1336; AFOSR-84-0178TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

This document describes a control structure for building an Image Understanding System. This system can deal with objects with diverse appearances when consistent spatial relations exist between objects. By accumulating consistent predictions originated from existing instances, our system can dynamically reason about what to do in order to construct interpretations of the image. This paper, discusses parts of the proposed system - the representation of spatial knowledge, the accumulation of evidence, the focus of attention mechanism, and the integration of constraints for top-down control. Author (GRA)

N84-25026# Naval Research Lab., Washington, D. C.
INSTRUMENTATION REQUIREMENTS FOR SMALL SCALE TOWED TEMPERATURE MEASUREMENTS Memorandum Report
J. P. Dugan and W. D. Morris 28 Mar. 1984 26 p
(DA Proj. R12-99-OS)
(AD-A139897; NRL-MR-5288) Avail: NTIS HC A03/MF A01 CSCL 08/10

Measurements of horizontal ocean temperature structure are difficult to obtain by towing sensors from research vessels because the tow cable induces sensor platform motions which contaminate the data. In this report, temperature data which previously were acquired in the thermocline with special care are used to specify the acceptable level of motion and to prescribe appropriate sensor noise levels. In the swell-induced ship motion band, for example, the rms vertical displacements of the sensors should be less than several centimeters and temperature sensors should resolve fluctuations of one millidegree Celsius in regions of high (approx 0.1 C/m) temperature gradient. GRA

N84-25027# Army Engineer Topographic Labs., Fort Belvoir, Va.
METHODOLOGICAL PRELIMINARIES TO THE DEVELOPMENT OF AN EXPERT SYSTEM FOR AERIAL PHOTO INTERPRETATION Research Report, 15 Jul. - 1 Sep. 1983
R. R. Hoffman Jan. 1984 137 p
(AD-A139899; ETL-0342) Avail: NTIS HC A07/MF A01 CSCL 14/5

This report describes an investigation of the psychological aspects that affect the reasoning of expert aerial photo interpreters. The purpose of the study is to help develop an artificial intelligence expert system to aid terrain analysis. Artificial intelligence offers tools for studying and representing expert knowledge and reasoning. This study examines four methods for extracting the expert's knowledge: the Standard Terrain Analysis Method, the Structured Interview Method, the Limited Information Task, and the Method of Tough Cases. Criteria are presented for analyzing the four methods, and criteria that must pertain to aerial photo interpretation in order for expert systems tools to be applicable are described. This report discusses the structure of expert systems in general and the structure of an expert system for photo interpretation in particular. GRA

N84-25028# Utah Univ., Salt Lake City. Dept. of Chemistry.
A STEREOSPECIFIC VAPOR DETECTOR Final Report, 11 Aug. 1981 - 15 Dec. 1983
J. Michl and J. J. Brophy 26 Mar. 1984 8 p
(Contract DAAG29-81-K-0137)
(AD-A139965; ARO-18407.2-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

It has been discovered that it is possible to produce stable intimate mixtures of normally incompatible materials (such as sodium chloride and benzene) by vapor co-deposition on a very cold surface. Some spectroscopic and chemical properties of the novel materials have been investigated, and it is concluded that they show potential for the development of specific sensors. Author (GRA)

N84-25029# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
RADIAC SURVEY INSTRUMENTATION Final Report
2 Nov. 1983 30 p Supersedes MTP-8-2-172
(AD-A140084; TOP-8-2-172; MTP-8-2-172) Avail: NTIS HC A03/MF A01 CSCL 18/4

This test operations procedure (TOP) prescribes engineering test procedures to determine the technical performance of radiac survey instrumentation. Comparison of test results with technical specifications permits evaluation of their suitability for an intended end use. Modern battlefield conditions have made it necessary that commanders have radiological information concerning contamination of occupied areas. Fall-out predictions provide some information; however, predictions must be confirmed by measurements. Radiacmeters have been developed to fulfill this measurement requirement. This TOP is limited to tests outlined herein, which are applicable to radiacmeters designed for ground and aerial survey. The following tests will measure: (1) Directional Response - The objective of this subtest is to determine the response of the test item to radiation coming from different directions. (2) Accuracy - The objective of this subtest is to determine whether measurements of radiation can be made accurately and repeatedly. (3) Response Time - The objective of this subtest is to determine the ability of radiacmeter to respond to rapidly changing radiation dose rates. (4) Drift - The objective of this subtest is to determine the drift characteristics of the radiacmeter. (5) Warm-up Time - The objective of this subtest is to determine the warm-up time required before the instrumentation can accurately indicate radiation. GRA

N84-25030# Florida Univ., Gainesville. Space Astronomy Lab.
SHUTTLE FLIGHT TEST OF AN ADVANCED GAMMA-RAY DETECTION SYSTEM Final Scientific Report, 1 Jan. 1982 - 31 Mar. 1983
A. C. Rester, Jr. Nov. 1983 11 p
(Grant AF-AFOSR-0060-82; AF Proj. 2309)
(AD-A136157; AFOSR-83-1199TR) Avail: NTIS HC A02/MF A01 CSCL 09/5

A detector system consisting of an n-type, high-purity germanium detector in a bismuth germanate anticompton shield has been developed for flight on a space shuttle mission. The BGO shield consists of six trapezoidal segments, each one being 14.6 cm long by 2.74 cm thick, mounted in a hexagonal shape about the axis of the germanium detector can. Author (GRA)

N84-25031# Stanford Linear Accelerator Center, Calif.
LARGE AREA SPARK COUNTERS WITH FINE TIME AND POSITION RESOLUTION
A. Ogawa, W. B. Atwood, N. Fukiwara (Nara Women's Univ., Japan), Yu. N. Pestov (Academy of Sciences, Novosibirsk), and R. Sugahara (National Lab. for High Energy Physics, Ibaraki, Japan) Oct. 1983 4 p refs Presented at the Nucl. Sci. Symp., San Francisco, 19-21 Oct. 1983 Sponsored in part by Japan-US Co-Operative Research Project on High Energy Physics.
(Contract DE-AC03-76SF-00515)
(DE84-007804; SU-SLAC-PUB-3298; CONF-831015-41) Avail: NTIS HC A02/MF A01

The key properties of these spark counters devices which include their capability of precision timing and of measuring the position of the charged particle to high accuracy were examined. The devices were developed for use in high energy physics experiments which involve large detectors. A spark counter of size 1.2 m x 0.1 m was constructed and is in operation continuously. Details of its construction and its properties as a particle detector are discussed. DOE

N84-25032# Fermi National Accelerator Lab., Batavia, Ill.
MEASUREMENT OF ELECTROMAGNETIC SHOWER POSITION AND SIZE WITH A SATURATED AVALANCHE TUBE HODOSCOPE AND A FINE GRAINED SCINTILLATION HODOSCOPE
R. Rameika, B. Cox, C. M. Jenkins, D. J. Judd, G. Hale, P. O. Mazur, C. T. Murphy, F. Turkot, D. E. Wagoner, C. Shen (Shandong Univ.) et al Jan. 1984 11 p refs Presented at the Nucl. Sci. Symp., San Francisco, 19-21 Oct. 1983 Prepared in cooperation with McGill Univ., Montreal and Stanford Linear Accelerator Center, Calif.
(Contract DE-AC02-76CH-03000)
(DE84-007247; FERMILAB-CONF-84/22-E; CONF-831015-39) Avail: NTIS HC A02/MF A01

A hodoscope was constructed from 100 micron diameter wires and brass tubes (1.2 x 0.7 cu cm cross section) filled with a mixture of argon, ethane and ethyl alcohol. It was tested in the saturated avalanche mode in an SCG1-C electromagnetic shower detector to determine its properties for the measurement of the position and size of electromagnetic showers. Two of these tube hodoscopes were positioned 3.5 radiation lengths deep in the detector and the profiles of 1 to 25 GeV electromagnetic showers were measured. Simultaneous measurements were performed using a plane of twenty, 0.5 cm wide scintillation counters positioned immediately behind the gas tube hodoscope. In addition the transition between saturated avalanche and limited streamer modes was measured for the tube hodoscopes. DOE

N84-25033# California Univ., Berkeley. Lawrence Berkeley Lab.
NEW DEVELOPMENTS IN CYLINDER TESTING
E. Lee, D. Breithaupt, N. Parker, J. Walton, and W. G. VonHolle 1983 15 p ref Presented at the Phys. of Explosives Tech. Meeting, Unterluss, West Germany, 2-4 Nov. 1983
(Contract W-7405-eng-48)
(DE84-002782; UCRL-89846; CONF-8311104-2) Avail: NTIS HC A02/MF A01

The measurement diagnostics and analysis of the cylinder test which increased the precision and the resolution several fold is discussed. Babry-Perot interferometry and higher speed, higher magnification streak cameras were employed. The tests are now commonly carried out using 2 in. (5.08 cm) copper tubes instead of 1 in. (2.54 cm) tubes. The tube wall thickness is, however, unchanged .1 in. (.25 cm), which effectively increases the time resolution. The early expansion history is evaluated with high precision. The analysis of cylinder test data for composite explosives reveals the key factors which control explosive performance. Test data on mixtures of ammonium nitrate (AN) and TNT and mixtures of HMX, TATB and BTF demonstrate the importance of particle size, stoichiometry and temperature. DOE

N84-25034*# National Academy of Sciences - National Research Council, Washington, D. C. Board on Physics and Astronomy.
PROCEEDINGS OF A WORKSHOP: MULTIDISCIPLINARY USE OF THE VERY LONG BASELINE ARRAY Final Report, 1 Nov. 1982 - 31 Mar. 1984
Feb. 1984 202 p refs Sponsored in part by NASA and Defense Advanced Research Projects Agency
(Contract MDA903-83-M-5896; Grants NSF AST-83-03119; NA83AA-A-02632)
(NASA-CR-173541; NAS 1.26:173541; PB84-163690) Avail: NTIS HC A10/MF A01 CSCL 14B

The National Research Council organized a workshop to gather together experts in very long baseline interometry, astronomy, space navigation, general relativity and the earth sciences. The purpose of the workshop was to provide a forum for consideration of the various possible multi-disciplinary uses of the very long baseline array. Geophysical investigations received major attention. Geodesic uses of the very long baseline array were identified as were uses for fundamental astronomy investigations. Numerous specialized uses were identified. GRA

N84-25035# Envirogenics Systems Co., El Monte, Calif.
PROTOCOL FOR THE COLLECTION AND ANALYSIS OF VOLATILE POHCS (PRINCIPAL ORGANIC HAZARDOUS CONSTITUENTS) USING VOST (VOLATILE ORGANIC SAMPLING TRAIN) Final Report, Apr. 1983 - Feb. 1984
E. M. Hansen Mar. 1984 61 p refs
(Contract EPA-68-02-3697)
(PB84-170042; EPA-600/8-84-007) Avail: NTIS HC A04/MF A01 CSCL 14B

An operating protocol for sampling and analysis of voltatile organic constituents of flue gas from hazardous waste incinerators or other similar combustor systems using the Volatile Organic Sampling Train (VOST) is presented. It is intended to be used for guidance by personnel of the regulatory groups, personnel associated with engineering research and development, and the regulated community. The document is in two parts. Part A describes the key components of the train, the procedures for preparing the sorbent materials, and procedures for sample collection using the VOST. Part B describes the procedures for analyzing VOST sorbent cartridges for volatile principal organic hazardous constituents (POHCs) using purge-trap-desorb gas chromatography/mass spectrometry (P-T-D GC/MS). Quality control procedures are presented in both parts. Author (GRA)

N84-24609# Ferranti Ltd., Edinburgh (Scotland). Navigation Systems Dept.
CURRENT WORK ON HIGH-GRADE SPACE GYROS AT FERRANTI IN THE UK
John Welburn *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 4 p (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24654*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LDEF THERMAL MEASUREMENTS SYSTEM (P0003)
Robert F. Greene, Jr. *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 78-81 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14B

N84-24666*# Kent Univ., Canterbury (England).
MULTIPLE-FOIL MICROABRASION PACKAGE (A0023)
J. A. M. McDonnell, D. G. Ashworth, W. C. Carey, R. P. Flavill, and R. C. Jennison *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 117-120 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14B

N84-24677*# Georgia Inst. of Tech., Atlanta.
HOLOGRAPHIC DATA STORAGE CRYSTALS FOR LDEF (A0044)
W. Russell Callen and Thomas K. Gaylord *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 152-153 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14E

N84-24682*# Instruments Service Aerodynamique, Longjumeau (France).
RULED AND HOLOGRAPHIC GRATINGS EXPERIMENT (A0138-5)
Gilbert Moreau *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 163-164 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 14E

N84-24876# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
CONSERVATION LAWS FOR SOME SEPARABLE GYROSCOPIC DYNAMICAL SYSTEMS Abstract Only
Leon Y. Baher and Harry G. Kwatny *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 74 refs Previously announced as A83-50125 Submitted for publication (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/2

N84-24877# Pennsylvania State Univ., University Park.
OPTIMAL DESIGN OF ROTATING DISK WITH TEMPERATURE GRADIENT Abstract Only
L. W. Hu and X. C. Pan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 75-76 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/2

N84-25080*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ACTUATOR DEVELOPMENT FOR THE INSTRUMENT POINTING SYSTEM (IPS)
Klaus Suttner *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 15-28 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 14B

N84-25092*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACELAB 4: PRIMATE EXPERIMENT SUPPORT HARDWARE
Paul R. Fusco and Richard J. Peyran *In its* The 18th Aerospace Mech. Symp. May 1984 p 215-241 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 14B

N84-25155# Royal Inst. of Tech., Stockholm (Sweden).
GEOMETRICAL TESTING OF X, Y PLOTTERS
Kennert Torlegaard *In its* Photogrammetric Res. 1983 24 p (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

N84-25546# Konkoly Observatory, Budapest (Hungary).
SOME PROBLEMS IN CALIBRATING UBV PHOTOMETRY FOR EFFECTIVE TEMPERATURE AND SURFACE GRAVITY Abstract Only
Szabolcs Barcza and S. Szilagyi *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 14-16 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-25036*# Johns Hopkins Univ., Baltimore, Md. Dept. of Electrical Engineering and Computer Science.

DYE LASER TRAVELING WAVE AMPLIFIER Interim Status Report
F. Davidson and J. Hohman Jan. 1984 21 p
(Contract NCC5-24)
(NASA-CR-175228; NAS 1.26:175228) Avail: NTIS HC A02/MF A01 CSCL 20E

A flashlamp pumped dye laser suitable for use as a single stage amplifier is described. Particular emphasis is placed on the efforts to increase output pulse energy and improve the temporal profile of the injected pulse. By using high power thin film polarizers, output energies reach from 4 to 45 mJ. Various dispersive elements are used to develop an amplified pulse with an extremely clean temporal profile. M.A.C.

N84-25037*# National Aeronautics and Space Administration. Pasadena Office, Calif.
LASER PULSE DETECTION METHOD AND APPARATUS Patent Application
Willis Goss (JPL, California Inst. of Tech., Pasadena) and James R. Janesick, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 22 Feb. 1984 17 p
(Contract NAS7-100)
(NASA-Case-NPO-16030-1; US-Patent-Appl-SN-582494) Avail: NTIS HC A02/MF A01 CSCL 20E

A sensor is described for detecting the difference in phase of a pair of returned light pulse components, such as two components of a light pulse of an optical gyro. In an optic gyro, the two light components have passed in opposite directions through a coil of optical fiber, with the difference in phase of the returned light components determining the intensity of light shining on the sensor. The sensor includes a CCD (charge coupled device) that receives the pair of returned light components to generate a charge proportional to the number of photons in the received light. The amount of the charge represents the phase difference between the two light components. At a time after the transmission of the light pulse and before the expected time of arrival of the interfering light components, charge accumulating in the CCD as a result of reflections from components in the system, are repeatedly removed from the CCD, by transferring out charges in the CCD and dumping these charges. NASA

N84-25038# California Univ., Livermore. Lawrence Livermore Lab.
ULTRAFAST GATED INTENSIFIER DESIGN FOR LASER FUSION X-RAY FRAMING APPLICATIONS
Robert H. Price, Jay D. Wiedwald, Ralph Kalibjian, Stanley W. Thomas, and William M. Cook 1 Nov. 1983 21 p refs Presented at the Nucl. Sci. Symp., San Francisco, 19-21 Oct. 1983
(Contract W-7405-eng-48)
(DE84-007761; UCRL-89119; CONF-831015-42) Avail: NTIS HC A02/MF A01

A major challenge for laser fusion is the study of the symmetry and the hydrodynamic stability of imploding fuel capsules. Streaked x-radiography, in one space and one time dimension, does not provide sufficient information. Two dimensional frames of 10 to 100 ps duration are required with good image quality, minimum geometrical distortion, dynamic range greater than 1000 and greater than 200 x 200 pixels. A gated transmission line imager (TLI) can meet these requirements with frame times between 30 and 100 ps. An instrument of this type is developed. Progress on this instrument including theory of operation, ultrafast pulse generation and propagation, component integration, and high resolution phosphor screen development are presented. DOE

N84-25039# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.
MODEL CALCULATIONS FOR A CO2 MIXING LASER WITH SCREEN NOZZLE
Wolfgang Schall and Helmut Huegel Dec. 1983 140 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-859)
(DFVLR-FB-83-41; ESA-TT-859) Avail: NTIS HC A07/MF A01; DFVLR, Cologne DM 40,50

A semi-empirical, one dimensional model for a gasdynamic CO2 laser with screen mixing nozzle is presented. The calculation of profiles of small signal gain, available energy, and bounds for the laser power along the flow direction was based on the assumption of a finite mixing length. The calculated distributions were compared with experimental results and allow for their physical interpretation. Proposals for improving an existing laser are presented. Upper limits to the power of this particular device and for screen nozzle mixing lasers in general were determined based upon physically and technically realistic initial conditions. Author

N84-25040# California Univ., San Diego, La Jolla. Dept. of Chemistry.
FIVE TIMES COMPRESSION OF MODE-LOCKED ARGON ION LASER PULSES
C. G. Dupuy and P. Bado Mar. 1984 9 p
(Contract N00014-78-C-0325)
(AD-A139635; TR-17) Avail: NTIS HC A02/MF A01 CSCL 20/5

The authors report a five times compression of the 110 ps, 11 nJ pulses from a mode-locked argon ion laser. The pulses are frequency broadened and chirped during passage through a polarization conserving single-mode optical fiber 90 m in length, then compressd by a diffraction grating range stage to 22 ps. GRA

N84-25041# Sanders Associates, Inc., Nashua, N. H. Defensive Systems Div.
XeF PUMPED Tm:YLF LASER SCALING Final Report, 1 Apr. 1980 - 31 May 1981
E. P. Chicklis, J. Baer, M. Knights, and J. McCarthy Feb. 1984 88 p
(Contract N00014-80-C-0444)
(AD-A140004) Avail: NTIS HC A05/MF A01 CSCL 20/5

The laser requirements (energy per pulse, average power, beam quality) for the ground based Strategic Laser Communications (SLC) mission represent a significant advance over currently available technology. The combination of very high average power and near diffraction limited beam quality in a spectral region where comparatively few devices have been developed poses a severe challenge to the technology. This report describes work on a Tm:YLF laser, a resonantly pumped, crystalline solid state laser, which emits nominally at 450nm when pumped by the XeF rare gas halide laser. The technical objective of this program was the determination of the feasibility of XeF pumped Tm:YLF as a source for the SLC ground based mission. GRA

N84-25042# State Univ. of New York at Buffalo, Amherst. Dept. of Electrical and Computer Engineering.
CO-2 LASER HEATING OF SILICON AND APPLICATIONS
H. S. Kwok 1983 8 p refs Presented at the Soc. of Photo-Opt. Instrumentation Engrs. Conf., Santa Fe, N. Mex., 11 Apr. 1983
(Contract DE-AC02-81ER-10978)
(DE84-008273; DOE/ER-10978/4; CONF-830425-37) Avail: NTIS HC A02/MF A01

Pulsed CO2 laser interaction with doped silicon which can produce significant heating of the semiconductor are discussed. This heating is studied and two major applications are explored. Fast CO2 laser detection due to the rapid thermal generation of carriers is demonstrated. DOE

N84-25043# Los Alamos Scientific Lab., N. Mex. Chemistry Div.
LASER DIAGNOSTICS OF MATERIALS AND CHEMISTRY
Allen Hartford, Jr. 1984 36 p refs Presented at the 4th Intern. Conf. on High Temp. Sci. - HYTHERM, Santa Fe, N. Mex., 2-6 Apr. 1984
(Contract W-7405-eng-36)

(DE84-007469; LA-UR-84-711; CONF-8404110-1) Avail: NTIS HC A03/MF A01

Several examples are given of the ability of laser-based diagnostic techniques to make noninvasive measurements in hostile environments. Using coherent anti-Stokes Raman scattering both majority and minority species concentrations, as well as temperature, were measured in the hot, high-pressure, particle-laden stream of a coal gasifier. In addition, numerous toxic and corrosive elements in the gasifier stream were identified, but not yet quantified. In addition to providing the capability for making analytical determinations, laser techniques were extensively employed to measure the rates of elementary chemical reactions. Recently, the temperature regime over which such measurements are possible expanded. Although much of the laser diagnostic activity to date has involved investigations of the gas phase, significant information concerning heterogeneous phenomena can still be inferred. For instance, gas-solid reactions can manifest themselves as changes in vapor phase composition. DOE

N84-25044# Bendix Corp., Kansas City, Mo.
Nd: YAG LASER IMPROVEMENTS AND MODIFICATIONS
R. D. Holt and M. B. Mallory Mar. 1984 31 p ref
(Contract DE-AC04-76DP-00613)
(DE84-009024; BDX-613-2911) Avail: NTIS HC A03/MF A01

A 400 W Nd:YAG laser system was rebuilt and modified. Many improvements and additions were made, most notably: output power stability, flash lamp life, a laser flash inhibitor, a rotary axis, wire feed, power driven camera focus, and a power driven laser lens positioning system with digital display of position. This system now fully and reliably functions on the production line. These new additions significantly improve the versatility and capability of this laser system. DOE

N84-25045# Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source Office.
COLLECTIVE INSTABILITIES AND HIGH-GAIN REGIME FREE ELECTRON LASER
R. Bonifacio (Milano Univ.), C. Pellegrini, and L. M. Narducci (Drexel Univ.) 1983 24 p refs Presented at the Topical Meeting on Free Electron Generation of Extreme Ultraviolet Coherent Radiation, Upton, N.Y., 19-22 Sep. 1983
(Contract DE-AC02-76CH-00016)
(DE84-008172; BNL-34340; CONF-8309118-8) Avail: NTIS HC A02/MF A01

The operation of free electron lasers (FEL) in the short wavelength region, (1000 A), requires a large field amplification per undulator pass in order to overcome the large losses of the optical cavity at these wavelengths. Systems based on the combination of a storage ring and of a free electron laser can provide this large amplification. In fact, for these systems small signal gains of the order of 100 to 1000% per pass have been estimated. Of course, at this level of amplification, the small signal gain formula is no longer appropriate and a more accurate description of the FEL is required. FEL studies in the high gain regime have shown that, with an appropriate selection of the electron density, detuning, and undulator length, it is possible to produce an exponential growth of both the radiation field and of the electron bunching. This is the result of the emergence of a collective instability for the electron beam undulator radiation field system. The conditions for the onset of this instability were studied and the characteristic complex frequencies of the FEL system are derived. DOE

N84-25595*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HELIUM-NEON LASERS FOR REMOTE MEASUREMENTS OF NATURAL GAS LEAKS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 16-17 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-25046*# Spectra Research Systems, Inc., Huntsville, Ala.
BEARING TESTER DATA COMPILATION, ANALYSIS AND REPORTING AND BEARING MATH MODELING, VOLUME 1 Final Report
D. David Marshall, Edward E. Montgomery, Linda S. New, M. Anthony Stone, and Bruce K. Tiller May 1984 137 p refs
(Contract NAS8-34686)
(NASA-CR-171039; NAS 1.26:171039; SRS/SE-TR84-022-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 13I

Thermal and mechanical models of high speed angular contact ball bearings operating in LOX and LN2 were developed and verified with limited test data in an effort to further understand the parameters that determine or effect the SSME turbopump bearing operational characteristics and service life. The SHABERTH bearing analysis program which was adapted to evaluate shaft bearing systems in cryogenics is not capable of accommodating varying thermal properties and two phase flow. A bearing model with this capability was developed using the SINDA thermal analyzer. Iteration between the SHABERTH and the SINDA models enable the establishment of preliminary bounds for stable operation in LN2. These limits were established in terms of fluid flow, fluid inlet temperature, and axial load for a shaft speed of 30, 000 RPM. A.R.H.

N84-25047*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGY IN THE 80'S. VOLUME 2: SESSIONS 5 - 8
Aug. 1984 377 p refs Conf. held in Cleveland, 18-21 Apr. 1983 2 Vol.
(NASA-CP-2300-Vol-2; E-1559; NAS 1.55:2300-Vol-2) Avail: NTIS HC A17/MF A01 CSCL 13I

Tender standing and technical advancement of various disciplines and subdisciplines on tribology were discussed. Topics discussed included importance and definition of materials in tribology; directions of research in adhesion and friction; research in wear and wear resistant materials; liquid lubricants and additives; solid lubricants; and tribological materials for mechanical components of the future. For individual titles, see N84-25048 through N84-25062.

N84-25048*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELASTOHYDRODYNAMIC LUBRICATION. STATUS OF UNDERSTANDING
Bernard J. Hamrock *In its* Tribology in the 80's, vol. 2 Apr. 1984 p 507-531 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

The development of elastohydrodynamic lubrication which was divided into three main stages is discussed. The first stage is the development of the idealized form of elastohydrodynamic lubrication, where the surfaces are smooth, the fluid behavior is assumed to be Newtonian, and isothermal considerations are assumed. The complete spectrum of contact geometries contact materials and lubricant availability are presented. The second state of development incorporates the effects of a nonNewtonian fluid model, thermal effects, and surface roughness effects into the elastohydrodynamic lubrication model developed in stage one. Recent developments in this stage are presented. The third stage considers the items considered in stage two, the lubrication of real surfaces in their operating environments is examined. E.A.K.

N84-25049*# Georgia Inst. of Tech., Atlanta. Tribology and Rheology Lab.
TEMPERATURE EFFECTS IN ELASTOHYDRODYNAMICALLY LUBRICATED CONTACTS
Ward O. Winer *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 533-548 refs (For primary document see N84-25047 15-37)

Avail: NTIS HC A17/MF A01 CSCL 13I

Thermal phenomena in elastohydrodynamic contacts are reviewed. Measured temperatures are presented for representative conditions and ranges of operating parameters. Temperatures can range from bulk ambient temperature to several hundred degrees centigrade in fully separated elastohydrodynamic films. The mixed elastohydrodynamic films are outlined. These mixed conditions are common in tribological systems and conditions that border on unsuccessful run-in and failure of the elastohydrodynamic contact. In mixed film conditions local hot spots can have temperatures of the order of 1000 C which cause increased reactivity of the surfaces with surrounding materials and changes of the surface physical properties so important to the operation of concentrated contacts. The bulk system thermal transients which occur in tribological systems is discussed. These transients are frequently long in duration and have a direct bearing on the elastohydrodynamic film thickness and traction. E.A.K.

N84-25050*# Lulea Univ. (Sweden).
LUBRICANT RHEOLOGY IN CONCENTRATED CONTACTS
Bo O. Jacobson *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 555-572 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

Lubricant behavior in highly stressed situtations shows that a Newtonian model for lubricant rheology is insufficient for explanation of traction behavior. The oil film build up is predicted by using a Newtonian lubricant model except at high slide to roll ratios and at very high loads, where the nonNewtonian behavior starts to be important already outside the Hertzian contact area. Static and dynamic experiments are reported. In static experiments the pressure is applied to the lubricant more than a million times longer than in an EHD contact. Depending on the pressure-temperature history of the experiment the lubricant will become a crystallized or amorphous solid at high pressures. In dynamic experiments, the oil is in an amorphous solid state. Depending on the viscosity, time scale, elasticity of the oil and the bearing surfaces, the oil film pressure, shear strain rate and the type of lubricant, different properties of the oil are important for prediction of shear stresses in the oil. The different proposed models for the lubricant, which describe it to a Newtonian liquid, an elastic liquid, a plastic liquid and an elastic-plastic solid. E.A.K.

N84-25051*# Leeds Univ. (England). Dept. of Mechanical Engineering.
NON-STEADY STATE EFFECTS IN EHL
Duncan Dowson *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 579-592 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

Lubricated machine elements are subjected to cyclic variations of load and speed, particularly in reciprocating machinery. Squeeze film action plays an important role in preserving satisfactory lubricating films in many cases in which the entraining velocities fall to zero during each cycle, as in the reciprocating seal and synovial joints. The essential features of combined entraining and normal motion for hydrodynamic and elastohydrodynamic conditions are described. It is shown that very small squeeze film velocities lead to substantial hydrodynamic action. A squeeze film lubrication between spheres or cylinders and a plane is reviewed by an analysis of ankle joint lubrication. It is shown that elastohydrodynamic lubrication might be encountered in the conjunction between a piston ring and cylinder liner and that combined entraining and squeeze film action is important. The 2 stroke Diesel engine shows that variations in squeeze film velocity throughout the conjunction, associated with time rates of change of elastic deformation, must be considered in a full elastohydrodynamic lubrication analysis. E.A.K.

N84-25052*# Case Western Reserve Univ., Cleveland, Ohio.
REAL SURFACE EFFECTS IN ELASTOHYDRODYNAMIC LUBRICATION
John H. Tripp *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 595-614 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

The real effects in electrohydrodynamic lubrication (EHL,) are discussed and the role of stochastic roughness superimposed on the nominal solid boundaries is considered. The full film EHL regime where incipient asperity contact bears a negligible fraction of the load is analyzed. Flow, from which an averaged Reynolds equation can be formed, is nonetheless modified by the amplitude and texture of the roughness patterns. It is found that only two extra parameters are needed, the rms surface height and the ratio of the correlation lengths in the two principal roughness directions. In a lowest order perturbation expansion of these flow factors in powers of the ratio of rms roughness to nominal film thickness, no other properties of the roughness appear. The factors describing Poiseuille flow are separable into the sum of two single surface flow factors which means that a combination of a single equivalent rough surface versus an ideal smooth surface is found. For flow entrained by slip velocity the factors separate instead into a difference of single surface factors and it becomes significant which of the two surfaces carries the equivalent roughness. Applications of the averaged Reynolds equation based on the flow factor method to the EHL line contact problem are discussed. The partial EHL regime is considered where comparable load fractions are carried by the hydrodynamic film and by incipient mechanical contact. An extension of the method into this regime by combining it with asperity contact models appears most encouraging. E.A.K.

N84-25053*# Northwestern Univ., Evanston, Ill. Dept. of Mechanical and Nuclear Engineering.
MICRO-ELASTOHYDRODYNAMIC LUBRICATION
H. S. Cheng *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 615-639 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

Conventional elastohydrodynamics, which is based on assumption of smooth surfaces, is reviewed to show its insufficiency for explaining the failure processes in these contacts. For conditions approaching failure, lubrication breakdown occurs locally at asperity contacts where the lubrication behavior is controlled by microelastohydrodynamic lubrication (micro-EHL). The film formation mechanisms in micro-EHL conjunctions is described. The level of film thickness due to normal approach and sliding of a single asperity and due to asperity-asperity collision between two asperities is assessed. Possible influence of the micro-EHL to incipient scuffing failure, surface crack propagation and wear are discussed. E.A.K.

N84-25054*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
TRANSIENT EHL EFFECTS IN STARVED BALL BEARINGS
E. Kingsbury *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 641-649 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

The independent variables used in most calculations for EHL film thickness in ball bearings involve lubricant properties, contact elasticity, load, and bearing kinematics. The calculations are for steady state, and they give a time constant film thickness. Four distinct processes in starved ball bearings which are explained by assuming a time varying film thickness are shown. The four processes and another transient EHL effect which does not involve the thickness of the film are described. A simple model allows direct calculation of several of the thickness transients. E.A.K.

N84-25055*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS AND NEW DIRECTIONS FOR SOLID LUBRICANT COATINGS AND COMPOSITE MATERIALS c27
Harold E. Sliney *In its* Tribology in the 80's, vol. 2 Apr. 1984 p 665-680 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11H

At one time, solid lubricants were used almost entirely in aerospace applications. Today there is a pronounced trend to use

them over a much broader range of applications. For example, self-lubricating polymer-based composites have displaced traditional oil-lubricated, metallic composites for many journal bearings and thrust washers in applications as diverse as earth-moving machinery and snow blowers to aircraft applications. For moderate temperatures below 200 C, glass filament-wound epoxy bearings with PTFE lubricating liners are useful; for temperatures up to 350 C, graphite fiber reinforced polyimide bearing materials are finding applications. Advanced technology engines have severe lubrication and wear problems at temperatures beyond the capabilities of any of these lubricants. Here, self-lubricating ceramics and inorganic composites for use at 1000 C or higher are of interest. However, perhaps the most significant new direction for solid lubricant coatings and self-lubricating composites is their steadily increasing use in dry bearings for large volume, moderate temperature applications. This can be attributed to their simplicity of use (no supporting lubricant system needed), light weight, convenience, and general cost effectiveness. M.G.

N84-25056*# Hohman Plating and Mfg., Inc., Dayton, Ohio.
PRACTICAL APPLICATIONS AND USES OF SOLID LUBRICANT FILMS **c27**
Bernard C. Stupp *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 681-702 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11H

Practical applications are illustrated with discussions covering the reasons for use of solid lubricants, required performance, lubricant selection, and results obtained for the various examples shown. The applications described cover a broad range of solid lubricants. Included are soft lamellar compounds, organic polymers, soft elemental metals, oxides and compounds for high temperature use. The illustrations selected cover a broad range of lubricant application techniques delineating the reasons for the different processing procedures which include bonded films, plasma spraying, sputtering, ion plating and electrodeposition. Author

N84-25057*# Dow Corning G. m. b. H., Munich (West Germany).
SUPPORT OF OIL LUBRICATION BY BONDED COATINGS **c27**
Ruediger Holinski *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 709-721 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11H

A new generation of lubricating lacquers for treatment of metal surfaces has been developed. These coatings have proved to be oil-compatible and are used in oil-lubricated systems. The oil lubrication is supported thereby through reduction of friction and increase of load-carrying capacity during boundary conditions. For difficult tribological systems, the problem-solving lubricating concept has proved to be the beneficial combination of lubricating oil and bonded coatings. A number of practical applications are presented. Author

N84-25058*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS OF PLASMA PHYSICS TECHNIQUES FOR THE DEPOSITION OF TRIBOLOGICAL COATINGS **c75**
Taialdis Spalvins *In its* Tribology in the 80's, vol. 2 Apr. 1984 p 729-750 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 20I

The plasma physics deposition techniques of sputtering and ion-plating are reviewed. Their characteristics and potentials are discussed in terms of synthesis or deposition of tribological coatings. Since the glow discharge or plasma generated in the conventional sputtering and ion-plating techniques has a low ionization efficiency, rapid advances have been made in equipment design to further increase the ionization efficiency. The enhanced ionization favorably affects the nucleation and growth sequence of the coating. This leads to improved adherence and coherence, higher density, favorable morphological growth, and reduced internal stresses in the coatings. As a result, desirable coating characteristics can be precision tailored. Tribological coating characteristics of sputtered solid film lubricants such as MoS2, ion-plated soft gold and lead metallic films, and sputtered and ion-plated wear-resistant refractory compound films such as nitrides and carbides are discussed. M.G.

N84-25059*# Minnesota Univ., Minneapolis.
SPUTTERING AS A TECHNIQUE FOR APPLYING TRIBOLOGICAL COATINGS
S. Ramalingam *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 753-772 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

Friction and wear-induced mechanical failures may be controlled to extend the life of tribological components through the interposition of selected solid materials between contacting surfaces. Thin solid films of soft and hard materials are appropriate to lower friction and enhance the wear resistance of precision tribo-elements. Tribological characteristics of thin hard coats deposited on a variety of ferrous and non-ferrous substrates were tested. The thin hard coats used were titanium nitride films deposited by reactive magnetron sputtering of metallic titanium. High contact stress, low speed tests showed wear rate reductions of one or more magnitude, even with films a few micrometers in thickness. Low contact stress, high speed tests carried out under rather severe test conditions showed that thin films of TiN afforded significant friction reduction and wear protection. Thin hard coats were shown to improve the friction and wear performance of rolling contacts. Satisfactory film-to-substrate adhesion strengths can be obtained with reactive magnetron sputtering. X-ray diffraction and microhardness tests were employed to assess the effectiveness of the sputtering technique. R.S.F.

N84-25060*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Business Group.
STATUS OF UNDERSTANDING FOR BEARING MATERIALS **c26**
E. N. Bamberger *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 773-794 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 11F

The structural materials and potential failure modes for high technology aircraft gas turbine bearings are reviewed. Among the failure modes discussed for iron-base through-hardened bearing materials are fatigue, surface distress, and corrosion. It is shown that the sub-surface initiated rolling-contact fatigue failure mode is reasonably well understood and in most cases can be controlled by proper material selection and design. Current bearing materials provide long life and high reliability in existing applications. A new generation of materials are being developed which will provide improved fracture toughness, better corrosion resistance, and a further extension of bearing fatigue life. Bearing problems due to surface distress, caused by a variety of surface and near surface anomalies, are less well understood. This area will require the implementation of an interdisciplinary effort to improve the level of understanding of metallic surface-lubricant reactions and interactions. R.S.F.

N84-25061*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS OF UNDERSTANDING FOR GEAR MATERIALS
Dennis P. Townsend *In its* Tribology in the 80's, vol. 2 Apr. 1984 p 795-809 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

A wide variety of gear materials is available today for the gear designer. The choice of which material to use should be based on the requirements of the application and will include the operating conditions of load, speed, and temperature in addition to reliability, weight, noise limitation, accuracy, and cost. In aircraft applications such as helicopters, V/STOL aircraft, and turboprops, the dominant factors to be considered are reliability and weight. The following gear materials are reviewed herein with an emphasis upon mechanical properties, cost, and durability: plastics,

nonferrous metals, copper alloys, iron alloys, metal powders, and steels. R.S.F.

N84-25062*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
STATUS OF UNDERSTANDING FOR SEAL MATERIALS
P. F. Brown *In* NASA Lewis Research Center Tribology in the 80's, vol. 2 Apr. 1984 p 811-829 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 13I

Material selection for mainshaft face and ring seals, labyrinth seals, accessory gearbox face seals, and lip seals are discussed in light of tribology requirements and a given seal application. Carbon graphite has been found to be one of the best sealing materials and it is widely used in current gas turbine mainshaft and accessory gearbox seals. Its popularity is due to its unique combination of properties which consists of dimensional stability, corrosion resistance, low friction, good self lubricating characteristics, high thermal conductivity and low thermal expansion, the latter two properties combining to provide good thermal shock resistance. A brief description of the seals and the requirements they must meet are discussed to provide insight into the limitations and advantages of the seals in containing the lubricant. A forecast is made of the operational requirements of main shaft and gearbox seals for advanced engines and candidate materials and coatings that may satisfy these advanced engine requirements. Author

N84-25063*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LATCHING MECHANISM FOR DEPLOYABLE-RESTOWABLE COLUMNS Patent Application
Elvin L. Ahl, Jr., inventor (to NASA) Filed 2 May 1984 21 p
(NASA-Case-LAR-13169-1; US-Patent-Appl-SN-606431) Avail: NTIS HC A02/MF A01 CSCL 13I

A column longeron latch assembly provides the securing mechanism for the deployable, telescoping column of a hoop/column antenna. The column is an open lattice structure with three longerons disposed 120 deg apart as the principle load bearing member and is deployed from a pair of eleven nested bays disposed on opposite sides of a center section under the influence of a motor-cable-pulley system. The longeron latch is a four bar linkage mechanism using the over-center principle for automatically looking the longeron sections into position during deployment and serves to unlock the sections when antenna 10 is to be re-stowed. A spring pack, disposed in an end of each longeron, serves to absorb stress forces on the deployed column throught the cam head piston and the abutting latch from an adjacent longeron. NASA

N84-25064*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DUAL CLEARANCE SQUEEZE FILM DAMPER FOR HIGH LOAD CONDITIONS
David P. Fleming 1984 14 p refs Presented at the Joint Lubrication Conf., San Diego, Calif., 22-24 Oct. 1984; sponsored by ASME and the American Society of Lubrication Engineers
(NASA-TM-83619; E-2053; NAS 1.15:83619) Avail: NTIS HC A02/MF A01 CSCL 13I

Squeeze film dampers are widely used to control vibrations in aircraft turbine engines and other rotating machinery. However, if shaft unbalance rises appreciably above the design value (e.g., due to a turbine blade loss), a conventional squeeze film becomes overloaded, and is no longer effective in controlling vibration amplitudes and bearing forces. A damper concept characterized by two oil films is described. Under normal conditions, only one low-clearance film is active, allowing precise location of the shaft centerline. Under high unbalance conditions, both films are active, controlling shaft vibration in a near-optimum manner, and allowing continued operation until a safe shutdown can be made. Author

N84-25065*# United Technologies Research Center, East Hartford, Conn.
ABRASIVE TIP TREATMENT FOR USE ON COMPRESSOR BLADES Final Report
Herbert C. Pedersen Jan. 1984 73 p
(Contract NAS3-22813; DA Proj. 1L1-61102-AH-45)
(NASA-CR-174666; NAS 1.26:174666; PWA-5833-37) Avail: NTIS HC A04/MF A01 CSCL 13I

A co-spray process was used which simultaneously but separately introduces abrasive grits and metal matrix powder into the plasma stream and entraps the abrasive grits within a molten matrix to form an abrasive coating as the matrix material solidifies on test specimen surfaces. Spray trials were conducted to optimize spray parameter settings for the various matrix/grit combinations before actual spraying of the test specimens. Rub, erosion, and bond adhesion tests were conducted on the coated specimens in the as-sprayed condition as well as on coated specimens that were aged for 100 hours at a temperature of 866K (1100 F). Microscopic examinations were performed to determine the coating abrasive-particle content, the size and shape of the adhesive particles in the coating, and the extent of compositional or morphological changes resulting from the aging process. A nickel chromium/aluminum composite with No. 150 size (0.002 to 0.005 inch) silicon carbide grits was selected as the best matrix/abrasive combination of the candidates surveyed for coating compressor blade tips. A.R.H.

N84-25066# Army Mobility Equipment Research and Development Command, Fort Belvoir, Va.
EVALUATION OF THE PERFORMANCE OF FILTER SEPARATORS WITH GASOHOL Final Technical Report, Nov. - Dec. 1981
W. R. Williams Aug. 1983 19 p
(AD-A139645; MERADCOM-2389) Avail: NTIS HC A02/MF A01 CSCL 13/11

This report covers decontamination tests conducted on military standard filter/coalescer elements using unleaded gasoline and unleaded Gasohol (10 percent ethanol in gasoline). The use of Gasohol demonstrated improved solids removal ability over that of gasoline. Water removal efficiency could not be measured adequately as the injection of water caused separation of the Gasohol into two phases. Filter coalescer elements used with Gasohol act as contacting columns in the presence of water: their use is not recommended when water is present.
Author (GRA)

N84-25067# Battelle Columbus Labs., Ohio.
FRICTIONAL HOLD OF VARIOUS SHEAVE CONFIGURATIONS ON SYNTHETIC ROPES Final Report, Jan. - Nov. 1983
C. S. Albro, L. F. Nikodem, and D. W. Caudy Feb. 1984 155 p
(Contract N62583-83-M-R054)
(AD-A139808; NCEL-CR-84.016) Avail: NTIS HC A08/MF A01 CSCL 13/9

Thirty eight test series were conducted using eleven different sheave configurations, two sizes of polyester rope, and one size of nylon rope. Tests were conducted with a taut line wrapped around a rotating sheave in both wet and dry conditions. Friction coefficients were measured continuously from static to slipping condition. The test variables include line tension, sheave diameter, line diameter, groove geometry, groove surface roughness, groove coating material and speed of sheave rotation. The coefficient of friction was found to decrease with decreasing groove surface roughness, decreasing sheave diameter, increasing enclosed angle of the groove and increasing line tension. The rougher surfaces rapidly destroyed the line and are not recommended for use with traction winches. The frictional hold decreased as the line was wearing against the sheave surface. For traction winch design, a V-groove steel sheave with a smooth surface is recommended for polyester 2-in-1 braid. The nylon lines have approximately 10% greater frictional hold than polyester lines. Author (GRA)

N84-25068# Naval Postgraduate School, Monterey, Calif.
OPERATIONAL PERFORMANCE CHARACTERISTICS OF A MULTIPLY-SHROUDED, ANGLED-DIFFUSER STACK GAS EDUCTOR IN TURBULENT CROSS-FLOW M.S. Thesis
R. E. Jr. Staples Sep. 1983 219 p

(AD-A139953) Avail: NTIS HC A10/MF A01 CSCL 21/5

Performance characteristics of two multiple-ring diffuser educators were determined from collected data. The performance characteristics of a five ring diffuser model were compared with a geometrically similar model tested in cold flow. Model similarity for comparison was maintained through the Mach number. Both models were tested in a turbulent cross-flow simulating a 29.5 knot relative wind. Minor improvement in the pumping coefficient was seen to occur when cross-flow was introduced. External surface temperature measurements along the model assembly were recorded by two methods for comparative analysis. The effect of cross-flow is seen in a significant surface temperature reduction in the shroud assembly while apparent degradation of film cooling effectiveness at the diffuser rings resulted in minimal temperature change.

Author (GRA)

N84-25069# California Univ., Livermore. Lawrence Livermore Lab.

ULTRASONIC MACHINING (IMPACT GRINDING)

Hartford L. Rutan 28 Feb. 1984 7 p Presented at the Topical Meeting on Opt. Fabric. and Testing, Monterey, Calif., 18-20 Apr. 1984

(Contract W-7405-eng-48)

(DE84-007783; UCRL-90138; CONF-840494-4) Avail: NTIS HC A02/MF A01

Ultrasonic machining (impact grinding) of hard brittle materials is described and its use in optics is discussed. DOE

N84-25070# California Univ., Livermore. Lawrence Livermore Lab.

SPHERICAL LAPPING VELOCITIES

N. J. Brown and P. Paul Hed 12 Jan. 1984 6 p refs Presented at the Topical Meeting on Opt. Fabric. and Testing, Monterey, Calif., 18-20 Apr. 1984

(Contract W-7405-eng-48)

(DE84-005734; UCRL-90219; CONF-840494-3) Avail: NTIS HC A02/MF A01

The equations of motion for the general case of two mating spherical surfaces each rotating at an arbitrary speed in an arbitrary orientation are developed. This is also the case of a rotating lap stroked across a sphere or a lens block rotating at the same or different rotational velocity. Two examples of the use of these equations are also given. DOE

N84-25071# Fuel Injection Development Corp., Cherry Hill, N.J.

LEAN LIMIT CONTROL FOR INTERNAL COMBUSTION ENGINES Final Report

16 Jun. 1983 14 p

(Contract DE-FG01-80CS-15022)

(DE84-006542; DOE/CS-15022/T1) Avail: NTIS HC A02/MF A01

The purpose of the Lean Limit Control System is to provide a control system for internal combustion engines that will optimize fuel economy within the constraints of the federal emission standards. A technical description of the system is included. DOE

N84-25072# Oak Ridge National Lab., Tenn. Energy Div.

THEORETICAL ANALYSIS OF A KINEMATIC STIRLING-CYCLE HEAT PUMP FOR SPACE CONDITIONING APPLICATIONS

N. Domingo, W. L. Jackson, and F. C. Chen Mar. 1984 52 p refs

(Contract DE-AC05-84OR-21400)

(DE84-010240; ORNL/CON-149) Avail: NTIS HC A04/MF A01

A computer simulation was performed for a kinematic Stirling cycle heat pump third order code, which employs nodal analysis to solve numerically the governing differential equations. The effects of outdoor air (source) temperature, mean compression space pressure, crank speed, and heat exchanger design parameters on the performance of the Stirling cycle heat pump were analyzed. For the modified Stirling cycle heat pump, the indicated heating coefficient of performance (COP), which excluded mechanical and parasitic losses, ranged from 2.14 to 2.14 to 2.53 for outdoor air temperatures between 255.2 K (0(0)F) and 281.3 K (47(0)F), respectively. It is determined from the parametric study that, unlike typical vapor compression cycles, the Stirling cycle COP and heat capacity were relatively insensitive to outdoor air temperature. The possible application of the Stirling cycle heat pump in colder climates is suggested. DOE

N84-25073# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Mechanical and Aerospace Engineering.

STUDY OF PARTICULATE FORMATION AND RADIANT HEAT LOSS IN DIRECT INJECTION-TYPE DIESEL ENGINES Final Report

K. T. Rhee, S. L. Chang, J. Matonick, and C. Sheft Nov. 1983 99 p refs

(Contract DTRS-5680-C-00029)

(PB84-160100; DOT/RSPA/DMA-50/84/4) Avail: NTIS HC A05/MF A01 CSCL 21G

The formation process of diesel particulates and radiation heat transfer in diesel combustion was investigated. Particulate concentrations and radiation heat transfer were obtained by using a direct sampling technique and surface thermocouples, respectively, and a mutual relationship of the two source in cylinder data was sought. Approaches taken for this were the design and construction of a new single cylinder direct injection type diesel engine, construction of a continuous flow type sampling valve, fabrication of heat flux probes, and development of a theoretical model to compute radiation heat transfer in diesel combustion based on in cylinder species data and pressure. GRA

N84-24835# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.

HEAT FLOW, FLUID FLOW AND SOLIDIFICATION PHENOMENA IN WELD POOLS Abstract Only

Gregory Oreper and Julian Szekely *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 3-4 refs (For primary document see N84-24833 15-31)

Avail: NTIS HC A16/MF A01 CSCL 13/8

N84-24843# Indian Inst. of Tech., Madras. Production Engineering Section.

SURFACE FATIGUE CHARACTERISTICS OF TRANSMISSION GEARS Abstract Only

R. Krishnamurthy and P. Natarajan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 15-16 ref (For primary document see N84-24833 15-31)

Avail: NTIS HC A16/MF A01 CSCL 13/9

N84-24860# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.

LOW VELOCITY, TRANSVERSE NORMAL IMPACT OF A CLAMPED PLATE Abstract Only

L. W. Gause and Richard E. Llorens *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 53-54 Previously announced as N82-32430 (For primary document see N84-24833 15-31)

Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24869# Columbia Univ., New York. Dept. of Mechanical Engineering.

THE CONCEPTUAL DESIGN OF MECHANISMS AND MECHANICAL SYSTEMS Abstract Only

Ferdinand Freudenstein *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 64-65 (For primary document see N84-24833 15-31)

Avail: NTIS HC A16/MF A01 CSCL 11/9

N84-24870# Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics.

AUTOMATED DYNAMIC ANALYSIS OF MECHANISMS WITH FLEXIBLE LINKS Abstract Only

Burton Paul *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 66 (For primary document see N84-24833 15-31)

Avail: NTIS HC A16/MF A01 CSCL 13/9

N84-24872# Rutgers Univ., Newark, N. J. Dept. of Mechanical and Aerospace Engineering.
OPTIMIZATION OF HIGH SPEED LINKAGES Abstract Only
Ting W. Lee *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 68-69 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

N84-24894# Pennsylvania Univ., Philadelphia. Dept. of Mechanical Engineering and Applied Mechanics.
NON-HERTZIAN ROLLING CONTACT WITH LONGITUDINAL CREEPAGE Abstract Only
B. Paul and S. Singh *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1984 p 138 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

N84-24895*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ELASTOHYDRODYNAMIC LUBRICATION OF SMOOTH SURFACES Abstract Only
Bernard J. Hamrock *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 141-142 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

N84-24896# Northwestern Univ., Evanston, Ill.
ELASTOHYDRODYNAMIC LUBRICATION OF ROUGH SURFACES Abstract Only
H. S. Cheng *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 143 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

N84-24897# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
FRICTION IN ELASTOHYDRODYNAMIC CONTACTS Abstract Only
W. O. Winer *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 144-145 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/9

N84-24898# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SURFACE TOPOGRAPHY-CONNECTIONS BETWEEN LUBRICATION AND FAILURE INITIATION Abstract Only
L. D. Wedeven *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 146-147 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 13/8

N84-25079*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DESIGN AND DEVELOPMENT OF A RELEASE MECHANISM FOR SPACE SHUTTLE LIFE-SCIENCE EXPERIMENTS
Howard M. Jones and Robert G. Daniell *In its* The 18th Aerospace Mech. Symp. May 1984 p 1-14 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25081*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A PASSIVELY CONTROLLED APPENDAGE DEPLOYMENT SYSTEM FOR THE SAN MARCO D/L SPACECRAFT
William E. Lang, Harold P. Frisch, and Deborah A. Schwartz *In its* The 18th Aerospace Mech. Symp. May 1984 p 29-48 refs

(For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25083*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DESIGN AND TEST OF A LOW-TEMPERATURE LINER DRIVER/RATE CONTROLLER
Charles H. Lowry *In its* The 18th Aerospace Mech. Symp. May 1984 p 65-77 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25084*# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
EVOLUTION FROM A HINGE ACTUATOR MECHANISM TO AN ANTENNA DEPLOYMENT MECHANISM FOR USE ON THE EUROPEAN LARGE COMMUNICATIONS SATELLITE (L-SAT/OLYMPUS)
Martin D. DeAth *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 79-91 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25085*# European Space Tribology Lab., Risley (England).
THE IMPORTANCE OF THERMAL-VACUUM TESTING IN ACHIEVING HIGH RELIABILITY OF SPACECRAFT MECHANISMS
K. Parker *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 93-109 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25087*# Ball Aerospace Systems Div., Boulder, Colo. High Technology Div.
THE DESIGN AND DEVELOPMENT OF TWO-FAILURE TOLERANT MECHANISMS FOR THE SPACEBORNE IMAGING RADAR (SIR-B) ANTENNA
S. J. Presas *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 131-154 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25088*# General Dynamics Corp., San Diego, Calif.
INHERENT PROBLEMS IN DESIGNING TWO-FAILURE TOLERANT ELECTROMECHANICAL ACTUATORS
Stephen Hornyak *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 155-170 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25090*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE DESIGN AND DEVELOPMENT OF A SOLAR TRACKING UNIT
Irby W. Jones and James B. Miller *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 187-201 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25091*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
ANTENNA TRACKING MECHANISM FOR GEOSTATIONARY SATELLITES
Colin M. Francis *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 203-214 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25093*# Lockheed Missiles and Space Co., Palo Alto, Calif.
DESIGN OF A PRECISION ETALON POSITION CONTROL SYSTEM FOR A CRYOGENIC SPECTROMETER
J. N. Aubrun, K. R. Lorell, D. F. Zacharie, and J. B. Thatcher *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 243-262 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25094*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THE ELECTRON ECHO 6 MECHANICAL DEPLOYMENT SYSTEMS
Stewart C. Meyers, James E. Steffen (Minnesota Univ.), Perry R. Malcolm (Minnesota Univ.), and John R. Winckler (Minnesota Univ.) *In its* The 18th Aerospace Mech. Symp. May 1984 p 263-276 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

N84-25601*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FLASHBACK FLAME ARRESTERS FOR FUEL CARGO TANKS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 28-29 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 13I

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-25074# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Direction de la Qualite.
QUALITY CONTROL IN LARGE SYSTEMS DEVELOPMENT PHASE
H. Eychenne 1984 8 p Presented at ASQC Quality Congr. Trans., Denver, 1984
(SNIAS-832-422-102) Avail: NTIS HC A02/MF A01

The most important means used to assure, progressively during the whole development phase, that a large system will be able to satisfy the users are presented. In other words, the objective is to present the means of assuring the system's quality. First the problems to be solved are exposed, the major phases of a program from the initial requirements to the system utilization are recalled, some definitions for mutual understanding are explained and the different management specifications which have to be available when the development begins are mentioned as the management plans which must answer to this specifications. Author

N84-24851# Kagawa Univ. (Japan). Dept. of Information Science.
RELIABILITY-BASED DESIGN PRINCIPLE OF COMPOSITE MATERIALS WITH FAILURE PROBABILITY AS A STATISTIC Abstract Only
Hiroshi Ishikawa, Toshio Tanimoto (Boshisha Univ.), and Hitoshi Kimura *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 40-41 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/4

N84-24864# Villanova Univ., Pa. Dept. of Mechanical Engineering.
APPLICATION OF STRESS-GENERATED HEAT IN COMPOSITES TO THERMOGRAPHIC NDT Abstract Only
Philip V. McLaughlin, Jr. and Mukesh G. Mirchandani *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 58-59 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/4

N84-24875# Texas Univ., Austin. Dept. of Engineering Mechanics.
SURVIVAL PROBABILITY OF NON-LINEAR OSCILLATORS SUBJECTED TO BROAD-BAND RANDOM DISTURBANCES Abstract Only
P. D. Spanos *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 73 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 14/4

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-25075 National Physical Lab., Teddington (England). Div. of Materials Applications.
NUMERICAL SOLUTION OF RECTANGULAR ANISOTROPIC PLATES IN FLEXURE WITH FREE EDGES
D. H. Ferriss 1983 40 p refs
(NPL-DMA(A)-71; ISSN-0143-7313) Copyright. Avail: Issuing Activity

A finite difference technique for the numerical determination of the displacement of a rectangular anisotropic plate subjected to transverse flexural loading is described. The plate is assumed elastic and orthotropic with the axes of symmetry parallel to the edges and deflections are assumed to be small. Various edge conditions are considered, in particular those involving one free edge or two adjacent free edges. Both uniform and point loadings of the plate are treated in addition to the case in which a force is applied at a free corner. E.A.K.

N84-25076 Defence Research Information Centre, Orpington (England).
ACCELERATED TESTING
F. R. Borri Dec. 1983 28 p refs Transl. into ENGLISH of Elettron. Oggi (Italy), Nov. 1982 p 81-89
(DRIC-T-7073; BR90394) Copyright. Avail: Issuing Activity

Accelerated tests are carried out for many different purposes: (1) to determine the characteristics activation energies of various breakdown mechanisms; (2) to measure reliability of a product; (3) to predict the breakdown rates during life; (4) to monitor the quality and reliability of the products not deviating over time; and (5) to compare the products of competitors or different technological solutions for the same product. Distributions used to describe trends of data Weibull and Lognormal are discussed. Tests are made by accelerating temperature, stress and humidity. Semiconductor devices were tested by intensifying applied voltage. Electrostatic discharge resistance is also tested. E.A.K.

N84-25077 National Physical Lab., Teddington (England). Div. of Materials Applications.
DESIGN CALCULATIONS ASSOCIATED WITH THE LAYING OF SUBMARINE COMMUNICATION CABLES
D. H. Ferriss Mar. 1984 18 p refs
(NPL-DMA(A)-76; ISSN-0143-7313) Copyright. Avail: Issuing Activity

The stress and three dimensional configuration of cables used in the steady tow of an underwater plough during the laying of communication cables are described. The problem of a partially submerged elastic towing cable subjected to hydrodynamic drag is represented by a set of nonlinear ordinary differential equations with two point boundary conditions. The equations are solved numerically by a shooting technique. The stress and configuration of the communication cable to determine the conditions required to ensure that this does not foul the towing cable are calculated. E.A.K.

N84-25078*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 18TH AEROSPACE MECHANISMS SYMPOSIUM
Washington May 1984 321 p refs Symp. held in Greenbelt, Md., 2-4 May 1984; sponsored by NASA, the California Inst. of Tech., and LMSC
(NASA-CP-2311; Rept-84FO235; NAS 1.55:2311) Avail: NTIS HC A14/MF A01 CSCL 20K

Topics concerning aerospace mechanisms, their functional performance, and design specifications are presented. Discussed subjects include the design and development of release mechanisms, actuators, linear driver/rate controllers, antenna and

appendage deployment systems, position control systems, and tracking mechanisms for antennas and solar arrays. Engine design, spaceborne experiments, and large space structure technology are also examined. For individual titles, see N84-25079 through N84-25096.

N84-25079*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DESIGN AND DEVELOPMENT OF A RELEASE MECHANISM FOR SPACE SHUTTLE LIFE-SCIENCE EXPERIMENTS c37
Howard M. Jones and Robert G. Daniell *In its* The 18th Aerospace Mech. Symp. May 1984 p 1-14 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The design, development, and testing of a release mechanism for use in two life science experiments on the Spacelab 1, 4, and D1 missions is described. The mechanism is a self latching ball lock device actuated by a linear solenoid. An unusual feature is the tapering of the ball lock plunger to give it a near constant breakout force for release under a wide range of loads. The selection of the design, based on the design requirements, is discussed. A number of problems occurred during development and test, including problems caused by human factors that became apparent after initial delivery for crewtraining sessions. These problems and their solutions are described to assist in the design and testing of similar mechanisms. M.A.C.

N84-25080*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ACTUATOR DEVELOPMENT FOR THE INSTRUMENT POINTING SYSTEM (IPS) c35
Klaus Suttner *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 15-28 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 14B

The mechanisms of the instrument pointing system (IPS) are described. Particular emphasis is placed on the actuators which are necessary for operating the IPS. The actuators are described as follows: (1) two linear actuators that clamp the gimbals down during ascent and descent; (2) two linear actuators that attach the payload to the IPS during the mission, and release it into the payload clamps; (3) one rotational actuator that opens and closes the payload clamps; and (4) three identical drive units that represent the three orthogonal gimbal axes and are the prime movers for pointing. Design features, manufacturing problems, test performance, and results are presented. M.A.C.

N84-25081*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A PASSIVELY CONTROLLED APPENDAGE DEPLOYMENT SYSTEM FOR THE SAN MARCO D/L SPACECRAFT c37
William E. Lang, Harold P. Frisch, and Deborah A. Schwartz *In its* The 18th Aerospace Mech. Symp. May 1984 p 29-48 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The analytical simulation of deployment dynamics of these two axis concepts as well as the evolution of practical designs for the add on deployable inertia boom units is described. With the boom free to swing back in response to Coriolis forces as well as outwards in response to centrifugal forces, the kinematics of motion are complex but admit the possibility of absorbing deployment energy in frictional or other damping devices about the radial axis, where large amplitude motions can occur and where the design envelope allows more available volume. An acceptable range is defined for frictional damping for any given spin rate. Inadequate damping allows boom motions which strike the spacecraft; excessive damping causes the boom to swing out and latch with damaging violence. The acceptable range is a design parameter and must accommodate spin rate tolerance and also the tolerance and repeatability of the damping mechanisms. M.A.C.

N84-25082*# Institute of Space and Astronautical Science, Tokyo (Japan).
DESIGN AND OPERATION OF A DEPLOYABLE TRUSS STRUCTURE
Koryo Miura *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 49-63 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 20K

A concept for the one dimensional deployable truss structure is presented. The deployed configuration of the structure consists of the repetition of a longitudinal octahedral truss module. The principal mechanical feature of the truss is that the lateral members comprising the lateral triangular truss are telescoping beams. Contracting of the lateral members results in the deployment of the truss structure. The geometric transformation of this truss of variable geometry is presented. Both simultaneous and sequential modes of transformation are possible. The validity of the transformation applied to the deployment is verified through design of a conceptual model. M.A.C.

N84-25083*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DESIGN AND TEST OF A LOW-TEMPERATURE LINER DRIVER/RATE CONTROLLER c37
Charles H. Lowry *In its* The 18th Aerospace Mech. Symp. May 1984 p 65-77 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The design and testing of a force/rate control device used to deploy an Earth shield on an orbiting satellite is described. Test experience, failure modes, and applications are emphasized. M.A.C.

N84-25084*# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
EVOLUTION FROM A HINGE ACTUATOR MECHANISM TO AN ANTENNA DEPLOYMENT MECHANISM FOR USE ON THE EUROPEAN LARGE COMMUNICATIONS SATELLITE (L-SAT/OLYMPUS) c37
Martin D. DeAth *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 79-91 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The evolution of an Antenna Deployment Mechanism (ADM) from a Hinge Actuator Mechanism (HAM) is described as it pertains to the deployment of large satellite antennas. Design analysis and mechanical tests are examined in detail. M.A.C.

N84-25085*# European Space Tribology Lab., Risley (England).
THE IMPORTANCE OF THERMAL-VACUUM TESTING IN ACHIEVING HIGH RELIABILITY OF SPACECRAFT MECHANISMS c37
K. Parker *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 93-109 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The work performed on thermal vacuum testing of complex mechanisms is described. The objective of these tests is to assess the mechanism reliability by monitoring performance in an environment that closely resembles the environment that will occur during flight. To be both valid and cost effective, these tests are performed in a detailed, formally controlled manner. A review of the major test observations is given, during which time some failure modes are detected. Full confidence now exists in many mechanism and component designs, and much valuable data obtained. M.A.C.

N84-25086*# General Electric Co., Philadelphia, Pa. Space Systems Operations Div.
IMPROVING SLIPRING PERFORMANCE c33
Donald N. Matteo *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 111-130 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 09A

The original slipring design for communications spacecraft,

the handling and testing of the slipring assembly before launch, the on orbit performance indicating the need for improvement in dynamic noise, the subsequently incorporated design improvements, and the results of testing to verify noise performance improvement are described. M.A.C.

N84-25087*# Ball Aerospace Systems Div., Boulder, Colo. High Technology Div.
THE DESIGN AND DEVELOPMENT OF TWO-FAILURE TOLERANT MECHANISMS FOR THE SPACEBORNE IMAGING RADAR (SIR-B) ANTENNA **c37**
S. J. Presas *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 131-154 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The performance requirements, design constraints, and design qualification status of the mechanisms necessary to restrain, deploy, and stow the Spaceborne Imaging Radar (SIR) B antenna experiment on the Shuttle Orbiters are described. M.A.C.

N84-25088*# General Dynamics Corp., San Diego, Calif.
INHERENT PROBLEMS IN DESIGNING TWO-FAILURE TOLERANT ELECTROMECHANICAL ACTUATORS **c37**
Stephen Hornyak *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 155-170 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

An electromechanical ac-powered rotary actuated four-bar linkage system for rotating the Shuttle/Centaur deployment adapter is described. The essential features of the deployment adapter rotation system (DARS) are increased reliability for mission success and maximum practical hazard control for safety. The requirements, concept development, hardware configuration, quality assurance provisions, and techniques used to meet two-fault tolerance requirements are highlighted. The rationale used to achieve a degree of safety equivalent of that of two-failure tolerance is presented. Conditions that make this approach acceptable, including single failure point components with regard to redundancy versus credibility of failure modes, are also discussed. Author

N84-25089*# Martin Marietta Corp., Denver, Colo.
PASSIVE SUN SEEKER/TRACKER AND A THERMALLY ACTIVATED POWER MODULE
Clete J. Siebert and Fred A. Morris *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 171-185 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 20K

Development and testing of two mechanisms using a shape memory alloy metal (NITINOL) as the power source are described. The two mechanisms developed are a passive Sun Seeker/Tracker and a generic type power module. These mechanisms use NITINOL wire initially strained in pure torsion which provides the greatest mechanical work capacity upon recovery, as compared to other deformation modes (i.e., tension, helical springs, and bending). Author

N84-25090*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE DESIGN AND DEVELOPMENT OF A SOLAR TRACKING UNIT **c37**
Irby W. Jones and James B. Miller *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 187-201 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The solar tracking unit was developed to support the Laser Heterodyne Spectrometer (LHS) airborne instrument, but has application to a general class of airborne solar occultation research instruments. The unit consists of a mirror mounted on two gimbals, one of which is hollow. The mirror reflects a 7.6 cm (3.0 in.) diameter beam of sunlight through the hollow gimbal into the research instrument optical axis. A portion of the reflected sunlight is directed into a tracking telescope which uses a four quadrant silicon detector to produce the servo error signals. The colinearity of the tracker output beam and the research instrument optical axis is maintained to better than + or - 1 arc-minute. The unit is microcomputer controlled and is capable of stand alone operation, including automatic Sun acquisition or operation under the control of the research instrument. Author

N84-25091*# Ford Aerospace and Communications Corp., Palo Alto, Calif.
ANTENNA TRACKING MECHANISM FOR GEOSTATIONARY SATELLITES **c37**
Colin M. Francis *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 203-214 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The design and development of a continuous duty cycle antenna tracking mechanism (ATM) for geostationary communications satellites is described. The FACC requirements for an ATM and description of the development mechanism designed and built for the program are presented. The mechanism mechanical configuration and component performance is documented along with its launch and operational constraints. The proposed development tests and the results of computer simulations are discussed. The advantages of this mechanism are its simplicity with inherent reliability, low mass, high stiffness, and ability to accurately point a wide range of antenna sizes. Author

N84-25092*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACELAB 4: PRIMATE EXPERIMENT SUPPORT HARDWARE **c35**
Paul R. Fusco and Richard J. Peyran *In its* The 18th Aerospace Mech. Symp. May 1984 p 215-241 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 14B

A squirrel monkey feeder and automatic urine collection system were designed to fly on the Spacelab 4 Shuttle Mission presently scheduled for January 1986. Prototypes of the feeder and urine collection systems were fabricated and extensively tested on squirrel monkeys at the National Aeronautics and Space Administration's (NASA) Ames Research Center (ARC). The feeder design minimizes impact on the monkey's limited space in the cage and features improved reliability and biocompatibility over previous systems. The urine collection system is the first flight qualified, automatic urine collection device for squirrel monkeys. Flight systems are currently being fabricated. Author

N84-25093*# Lockheed Missiles and Space Co., Palo Alto, Calif.
DESIGN OF A PRECISION ETALON POSITION CONTROL SYSTEM FOR A CRYOGENIC SPECTROMETER **c37**
J. N. Aubrun, K. R. Lorell, D. F. Zacharie, and J. B. Thatcher *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 243-262 refs (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The Upper Atmosphere Research Satellite (UARS) will be launched in 1988 to study the distribution of a series of trace elements in the upper atmosphere and to study atmospheric dynamics. The UARS carries on board a cryogenically cooled infrared spectrometer to measure the concentration of a series of chemical species that are important for understanding the ozone layer in the stratosphere. This device, known as the Cryogenic Limb Array Etalon Spectrometer (CLAES), uses a multiposition filter wheel combined with tilt-scanned Fabry Perot etalons to obtain the high resolution required for these experiments. The CLAES optical system is sealed in a dewar where it is maintained at cryogenic temperatures by a supply of solid hydrogen. Operating temperatures for CLAES range from 130 K at the entrance aperture to 13 K at the focal plane. The design and test of a special control system using a unique actuator concept to provide position and can control for the CLAES etalon are described. Results of performance tests at cryogenic temperatures simulating the CLAES on-orbit environment are discussed. Author

N84-25094*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ELECTRON ECHO 6 MECHANICAL DEPLOYMENT SYSTEMS c37
Stewart C. Meyers, James E. Steffen (Minnesota Univ.), Perry R. Malcolm (Minnesota Univ.), and John R. Winckler (Minnesota Univ.) *In its* The 18th Aerospace Mech. Symp. May 1984 p 263-276 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 13I

The Echo 6 sounding rocket payload was flown on a Terrier boosted Black Brant vehicle on March 30, 1983. The experiment requirements resulted in the new design of a rocket propelled Throw Away Detector System (TADS) with onboard Doppler radar, a free-flyer forward experiment designated the Plasma Diagnostic Package (PDP), and numerous other basic systems. The design, developmental testing, and flight preparations of the payload and the mechanical deployment systems are described. Author

N84-25095*# Indian Space Research Organization, Trivandrum. Space Center.
SEPARATION AND STAGING MECHANISMS FOR THE INDIAN SLV-3 LAUNCH VEHICLE c15
M. K. AbdulMajeed, K. Matarajan, and V. K. Krishnankutty *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 277-299 ref (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 22B

A unique separation and jettison system for the ascent fairing and a staging system for the apogee motor of the first Indian satellite launch vehicle are described. Design features, development problems, and mission constraints are discussed in addition to the solutions adopted. A qualification summary is included for each system, and flight results obtained from SLV-3 launches are described. Author

N84-25096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SMART MOTOR TECHNOLOGY c33
D. Packard and D. Schmitt (Lockheed Missiles and Space Co.) *In* NASA. Goddard Space Flight Center The 18th Aerospace Mech. Symp. May 1984 p 301-318 (For primary document see N84-25078 15-39)
Avail: NTIS HC A14/MF A01 CSCL 09C

Current spacecraft design relies upon microprocessor control; however, motors usually require extensive additional electronic circuitry to interface with these microprocessor controls. An improved control technique that allows a smart brushless motor to connect directly to a microprocessor control system is described. An actuator with smart motors receives a spacecraft command directly and responds in a closed loop control mode. In fact, two or more smart motors can be controlled for synchronous operation. Author

N84-25097# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
TIME DEPENDENT QUASIFRACTURE NUCLEATION AND PROPAGATION
C. C. Hsiao [1983] 20 p refs
Avail: NTIS HC A02/MF A01

The phenomenon of solid fracture is well documented, but many fracture studies accept a priori that a fracture exists within a given medium in the first place. An alternative approach is to consider the quasifracture behavior of a viscoelastic medium with an emphasis upon the dependence of crack propagation. A continuum model of quasifracture in a viscoelastic medium (polystyrene) prior to fracture development is advanced herein. This theory is particularly suited for solids. The parameters of fracture mechanics discussed include: fracture nucleation, crack propagation, crack geometry, modulus of elasticity, and creep. R.S.F.

N84-25098# GKSS-Forschungszentrum Geesthacht (West Germany). Inst. fuer Werkstofftechnologie.
REVIEW OF THE APPLICATION OF FRACTURE MECHANICS: POSSIBILITIES AND ACTUAL LIMITS [UEBERLEGUNGEN ZUR ANWENDUNG DER BRUCHMECHANIK: MOEGLICHKEITEN UND DERZEITIGE GRENZEN]
K. H. Schwalbe 1983 44 p refs In GERMAN; ENGLISH summary Presented at the 15 Deut. Verbands fuer Materialpruefung e.V. Session des Arbeitskreises Bruchvorgaenge, Darmstadt, West Germany, 22-23 Feb. 1983
(GKSS-83-E-63; ISSN-0344-9629) Avail: NTIS HC A03/MF A01

The principal possibilities and problems of the application of fracture mechanics are reviewed. A loading parameter, the crack field parameter-P is compared with a material property-R. It is demonstrated that failure loads, critical crack lengths, and residual lifetimes can be determined by procedures which are based on simple principles. The problems which may set limits to the application of these simple procedures are discussed. E.A.K.

N84-25099# Franche-Comte Univ., Besancon (France). Faculte des Sciences et de Techniques.
REANALYSIS OF MECHANICAL STRUCTURES Ph.D. Thesis [REANALYSE DE STRUCTURES MECANIQUES]
Amara Naji 1983 163 p refs In FRENCH
Avail: NTIS HC A08/MF A01

Techniques of the dynamic structural analysis of modified mechanical structures are reexamined. Dynamic systems models are developed through the use of algorithms that employ substructure dynamic methods and the finite element method. A new model is developed and a simple example discussed. Transl. by M.A.C.

N84-25100# National Aerospace Lab., Amsterdam (Netherlands). Structrues and Materials Div.
RESULTS OF A STUDY OF RESIDUAL STRESSES AND FATIGUE CRACK GROWTH IN LUGS WITH EXPANDED HOLES
A. Jongebreur and A. U. DeKoning 30 Apr. 1983 41 p refs Presented at 12th ICAF Symp., Toulouse, 25 - 27 May 1983
(NLR-MP-83024-U; Rept-S-161) Avail: NTIS HC A03/MF A01

Equations which describe the stress and deformation field during and after cold working a central hole in thin and thick walled rings are presented. Results calculated for these axially symmetric discs are compared with data obtained experimentally from tests on actual lugs. The theoretical model is used to study the effect of parametric variations, ratio of inner and outer radius, strain hardening coefficient and yield stress, on the residual stress field. Areas critical for stress corrosion cracking are indicated. The beneficial effect of hole expansion on the fatigue resistance of lugs is discussed. Results obtained for lugs precracked before application of the cold expansion process are presented. It is concluded that cold expansion of holes can have a beneficial effect on the fatigue resistance of lugs. E.A.K.

N84-25101# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
ANALYSIS OF DEFORMATION AND STRESSES NEAR COLD WORKED HOLES
A. U. deKoning 27 Oct. 1983 42 p refs In DUTCH; ENGLISH summary
(Contract NIVR-1903)
(NLR-TR-82113-U) Avail: NTIS HC A03/MF A01

Formulas to describe the deformation and stress fields near holes expanded by cold working are presented. Results and values obtained experimentally are compared and calculated by the finite element method. The model of the material includes linear hardening and a yielding behavior according to Tresca's criterion. Small strains are assumed and the elastic-plastic material behavior is described by the incremental theory of plasticity. To derive to the plane stress solution of the problem the Koiter corner point model is used. E.A.K.

N84-25102# Research Inst. of National Defence, Stockholm (Sweden).
AIR BLAST LOADINGS ON BUILDING ELEMENTS FROM DETONATING 8.4 Kg COMP HIGH EXPLOSIVE CHARGES
H. Axelsson and B. Tollbom Nov. 1983 85 p refs In SWEDISH;

ENGLISH summary
(FOA-C-20522-D4; ISSN-0347-3694) Avail: NTIS HC A05/MF A01

Pressure time histories on a test bench for blast loading of building elements were measured for 8.4 kg CompB high explosive charges detonated close to the ground surface at 5 to 17 m distance in front of the test bench. Pressures, impulses and durations for the overpressure and underpressure phases are presented and are compared with data for a free air TNT burst. E.A.K.

N84-25103# Research Inst. of National Defence, Stockholm (Sweden).
BLAST LOADINGS OF EMERGENCY EXITS FOR AIR-RAID SHELTERS TYPE E
Kjell Edin and Jan-Erik Jonasson Feb. 1984 42 p In SWEDISH; ENGLISH summary
(FOA-C-20530-D4(D6); ISSN-0347-3694) Avail: NTIS HC A03/MF A01

Standard emergency exit Type-E for air raid shelters were tested with short duration blast waves from detonating 48 kg high explosive Comp B/TNT charges at 2.3 and 3 m distance. The exit was undamaged and gas tight after the loading, but not with a cheaper design of the holding bolts. E.A.K.

N84-25104# Bristol Univ. (England). Dept. of Aeronautical Engineering.
OBLIQUE VORTEX INDUCED VIBRATION OF CYLINDERS B.S. Thesis
G. P. Gleed and M. J. Greenman Jun. 1983 37 p refs
(BU-295) Avail: NTIS HC A03/MF A01

Vortex shedding over circular cylinders when the motion of the cyclinder is constrained at an acute angle to the airflow was investigated. Such problems are associated with large diameters, suspended power cables and the damping mechanisms used to prevent their oscillation. Variation of both amplitude and power input with direction of motion for a cylinder in an airflow, and the velocity ranging from 0 to a maximum of 10 m/s were investigated. When the direction of motion had rotated to 60 degrees to the airflow, the amplitude had diminished by a factor of ten. The power introduced to the cylinder followed the same general trend. This was attributed to the transition between across flow and along flow oscillation, the latter being a comparatively low amplitude phenomenon. Author

N84-25105# Bristol Univ. (England). Dept. of Aeronautical Engineering.
INVESTIGATION OF A CYLINDRICAL INFLATED BEAM-COLUMN STRUCTURE B.S. Thesis
C. Winship and O. C. Powell-Jones Jun. 1983 52 p refs
(BU-301) Avail: NTIS HC A04/MF A01

The investigation of inflated circular cylinders by testing a single slender Melinex cylinder as a beam column structure, supported at the center of the beam with wires is reported. The inflated beam column structure carried a substantial load, many times its own weight, even after wrinkling; the value was limited by the extent of wrinkling of the membrane. Theoretical expressions for the unwrinkled deflection and wrinkle loads are derived, and are in agreement with the experimental results. E.A.K.

N84-25106# Oxford Univ. (England). Dept. of Engineering Science.
HIGH RATE STRAINING AND MECHANICAL PROPERTIES OF MATERIALS
J. Harding Nov. 1983 46 p refs Submitted for publication
(QUEL-1502/83) Avail: NTIS HC A03/MF A01

The various testing techniques which were developed for determining the mechanical properties of metallic materials at medium and impact rates of strain are reviewed. Attempts to attain higher strain rates are discussed. The various types of mechanical behavior observed at high rates of strain are described for different types of material and related to theoretical considerations based on the theories of thermally activated flow and viscous drag. Sudden jump in strain rate are discussed and attempts to develop a mechanical equation of state which is valid under high rates of strain are described. E.A.K.

N84-25107# Old Dominion Univ., Norfolk, Va.
LARGE DEFLECTION MULTIMODE RESPONSE OF CLAMPED RECTANGULAR PANELS TO ACOUSTIC EXCITATION, VOLUME 1 Final Report, 1 Oct. 1980 - 31 May 1983
C. Mei Wright-Pattersn AFB, Ohio AFWAL Dec. 1983 67 p
(Grant AF-AFOSR-0107-80; AF Proj. 2307)
(AD-A139622; AFWAL-TR-83-3121-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20/11

An analytical method is developed for the determination of large deflection multimodal random response of clamped rectangular plates subjected to normal incidence acoustic impingements. The Karman-Herrmann large deflection plate equations are solved by a technique which reduced the fourth order nonlinear partial differential equations to a set of second order nonlinear differential equations with time as the independent variable. The differential equation solution utilizes a Fourier-type series representation of the areas function and out-of-plane reflection. The compatibility equation is solved by direct substitution, and the equilibrium equation is solved through the use of Bubnov-Galerkin method. The acoustic excitation is assumed to be Gaussian. The Krylov-Bogoliuboc-Caughey equivalent linearization method is then employed so that the derived set of second order nonlinear differential equations is linearized to an equivalent set of second order linear differential equations. Transformations of coordinates from the generalized displacements to the normal-mode coordinates and an iterative scheme are employed to obtain root-mean-square (RMS) maximum panel deflection, RMS maximum strain and equivalent linear (or nonlinear) frequencies of vibration for clamped rectangular panels at various excitation pressure spectral density (PSD). Convergence of the results is demonstrated by using 4, 6, 10 and 15 terms in the transverse deflection function. Effects of panel length-to-width ratio and damping ratio on panel response are also studied. There are two volumes reporting this research effort; this volume, Volume 1, contains the mathematical formulations and numerical results, Volume 2 gives the computer program codes. Author (GRA)

N84-25108# Naval Research Lab., Washington, D. C.
BLAST-WAVE ANALYSIS OF HIGH-PRESSURE COUPLING SHELLS
B. H. Ripin, J. A. Stamper, and E. A. McLean 6 Mar. 1984 36 p (I25-BMXI)
(AD-A139687; NRL-MR-5279) Avail: NTIS HC A03/MF A01 CSCL 20/9

The interaction between an energetic laser-produced plasma which streams through an ambient plasma exhibits many properties of a blast wave. This document outlines the blast-wave theory and finds that it compares favorably to many features found in the NRL laser-plasma HANE simulation experiments. Contrary to expectations of an ideal blast wave, however, the laser-produced coupling fronts develop unusual nonuniformities; mechanisms that may be responsible for this structure are speculated upon. GRA

N84-25109# Naval Research Lab., Washington, D. C.
A METHOD TO COMPUTE THE CONTACT FORCE OF A BODY IMPACTING A RING-STIFFENED CYLINDRICAL SHELL USING A LUMPED PARAMETER FINITE-DIFFERENCE MODEL Progress Report
R. S. Schechter 12 Mar. 1984 29 p
(S03-66)
(AD-A139723; AD-E401117; NRL-MR-5286) Avail: NTIS HC A03/MF A01 CSCL 20/11

A method to compute the contact force of a body impacting a ring-stiffened shell using a lumped parameter finite-difference computer program is presented. The method is applied to a simulator torpedo. The derived force predicts velocity responses and shock spectra which agree well with measurements. Author (GRA)

N84-25110# Oregon State Univ., Corvallis. Dept. of Civil Engineering.
REVIEW OF PRELIMINARY ANALYSIS TECHNIQUES FOR TENSION STRUCTURES Final Report, 1 Oct. 1982 - 30 Sep. 1983
J. W. Leonard Feb. 1984 61 p
(Contract N62583-82-M-R674; F60-536)
(AD-A139853; NCEL-CR-84.017) Avail: NTIS HC A04/MF A01 CSCL 13/13

This report is a state of the art review of engineering approaches for the preliminary design and analysis of tension membrane structures. It defines three phases of construction which must be addressed, and then discusses the fundamental, nonlinear structural mechanics governing the behavior of each phase. Both computer and noncomputer methods are discussed in the report. The important engineering properties of fabric membranes are defined. The basic geometric nonlinearity of these structures is emphasized, and among other things, is said to preclude the practice of load case superposition. Establishing the nonlinear static reference configuration will often remain a difficult task. Once established, however, a linear dynamic analysis can be conducted for purposes of preliminary design, relative to the static configuration. It is noted that the amount of prestress in the static configuration has a large affect on the vibration properties of the structure. Ultimately, nonlinear effects must be included in the final design and analysis. Current analysis methods necessarily involve the computer are also expensive. The report concludes with recommendations for research to reduce the cost of structural analysis, to obtain additional engineering data on fabric stress-strain laws, and to obtain experimental data on the behavior of tension structures. GRA

N84-25111# Oak Ridge National Lab., Tenn. Solid State Div.
DISLOCATION SHIELDING MODEL OF FRACTURE TOUGHNESS
S. M. Ohr and S. J. Chang 1984 8 p refs Presented at the 113th Ann. Meeting of the Am. Inst. of Mining, Metallurgical and Petroleum Engr., Los Angeles, 26 Feb. 1984
(Contract W-7405-eng-26)
(DE84-007539; CONF-840218-5) Avail: NTIS HC A02/MF A01

A recently developed dislocation model of fracture toughness of a material depends directly on the number of dislocations in the plastic zone. The model is based on TEM observations that there is a dislocation free zone between the crack tip and the plastic zone and the crack tip is shielded from the applied stress by the dislocations in the plastic zone. Elasticity is restored in the region immediately ahead of the crack tip and hence it is possible to define a crack tip stress intensity factor. A review is given of the dislocation free zone model of fracture and the concept of dislocation shielding of a crack tip. An expression for the fracture toughness of a material is derived from the model in terms of the parameters describing the crack tip geometry. A criterion for ductile vs brittle fracture is proposed in terms of the condition for crack tip deformation. DOE

N84-24667*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
STUDY OF METEOROID IMPACT CRATERS ON VARIOUS MATERIALS (A0138-1)
J. C. Mandeville *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 121-123 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20K

N84-24844# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
A MICROCHEMICAL DERIVATION OF THE DIFFERENTIAL EQUATIONS OF INTERFACIAL STATICS. 3: LINE TENSION Abstract Only
M. Adler and H. Brenner *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 17 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24853# Rutgers Univ., New Brunswick, N. J. Dept. of Mechanical and Aerospace Engineering.
DYNAMIC INSTABILITY OF SUDDENLY HEATED, THICK, COMPOSITE SHELLS Abstract Only
H. Ray and C. W. Bert (Oklahoma Univ., Norman) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 43 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24854# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
TRANSVERSE SHEAR EFFECTS IN BIMODULAR COMPOSITE LAMINATES Abstract Only
Charles W. Bert and Faramarz Gordaninejad *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 44-45 ref Previously announced as N84-10195 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24855# Lehigh Univ., Bethlehem, Pa.
LONGITUDINALLY STIFFENED COMPOSITE MULTI-LAYER CYLINDRICAL SHELLS (AND RINGS) UNDER INTERNAL PRESSURE Abstract Only
D. P. Updike and U. Yuceoglu (Florida International Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 46 ref (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24856# Rochester Inst. of Tech., N. Y. Dept. of Mechanical Engineering.
ON SOME DYNAMIC PROBLEMS IN LAYERED ELASTIC-VISCOELASTIC BEAMS Abstract Only
Richard B. Hetnarski *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 47 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24857# Doshisha Univ., Kyoto (Japan). Dept. of Mechanical Engineering.
STATISTICAL FATIGUE AND RESIDUAL STRENGTH DEGRADATION MODEL FOR GLASS POLYESTER LAMINATES Abstract Only
Toshio Tanimoto and Hiroshi Ishikawa (Kagawa Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 48-49 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24858# Drexel Univ., Philadelphia, Pa. Dept. of Mechanical Engineering and Mechanics.
EFFECT OF STRESS SINGULARITIES ON THE DELAMINATION OF LAMINATED COMPOSITES Abstract Only
F. Delale *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 50 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24859# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
EFFECT OF INITIAL STRESSES ON THE IMPACT BEHAVIOR OF GRAPHITE-EPOXY LAMINATES Abstract Only
B. V. Sankar and C. T. Sun *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 51-52 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24862# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
IMPACT AND FATIGUE OF GRAPHITE/EPOXY LAMINATES

Abstract Only
William G. Patterson and Minoru Taya *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 56 Previously announced as A84-22269 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24863*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
THE EFFECT OF MATRIX PROPERTIES AND FIBER PROPERTIES ON IMPACT FAILURE MECHANICS Abstract Only
W. Elber *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 57 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24866# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
AN INTEGRAL OPTICAL METHOD FOR DETERMINING STRESS INTENSITY FACTORS Abstract Only
C. W. Smith, J. S. Epstein, and O. Olaosebikan *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 61 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24878# Kentucky Univ., Lexington. Dept. of Engineering Mechanics.
NONLINEAR VIBRATIONS OF A RUBBER SUPPORT SYSTEM CONSTRAINED BY A FIXED SURFACE Abstract Only
Millard F. Beatty *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 77 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24879# State Univ. of New York, Buffalo. Dept. of Mechanical and Aerospace Engineering.
CRITICALLY DAMPED DYNAMIC SYSTEMS Abstract Only
D. J. Inman and I. Orabi *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 78 refs (For primary document see N84-24833 15-39)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24880# Union Coll., Schenectady, N.Y. Dept. of Civil Engineering.
AN EXPRESSION OF STRAIN ENERGY INVOLVING COUPLE STRESSES IN SOLIDS Abstract Only
Surinder E. Lakhanpal *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 81-82 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24882# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
HELICAL SHEAR OF AN ELASTIC CIRCULAR TUBE WITH NON-CONVEX STORED ENERGY Abstract Only
R. L. Fosdick and G. P. MacSithigh (Missouri Univ., Rolla) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 84 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24883# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
STRESSES IN AND AROUND DOUBLE CONFOCAL SPHEROIDS EMBEDDED IN INFINITE MEDIA Abstract Only
Yozo Mikata and Minoru Taya *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 85 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24884# Maine Univ., Orono. Dept. of Mechanical Engineering.
APPROXIMATIONS FOR ELASTIC LAYERS AND A THREE-DIMENSIONAL ELASTICITY SOLUTION FOR A SIMPLY SUPPORTED RECTANGULAR PLATE Abstract Only
Mark Levinson *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 86-87 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24885# Sargent and Lundy, Engineers, Chicago, Ill.
INTEGRATED ANALYSIS AND DESIGN FOR MULTI-LEVEL PERFORMANCE CRITERIA
Mir M. Ali *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1984 p 95-96 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24899# California State Univ., Fresno.
STOCHASTIC SIMULATION OF CREEP BEHAVIOR Abstract Only
Chandra S. Brahma *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 174-175 Prepared in cooperation with Sverdrup and Parcel, Inc. (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-24900# Sandia Labs., Albuquerque, N. Mex. Thermomechanical and Physical Div.
STUDIES OF ELASTIC-PLASTIC RESPONSE UNDER HIGH PRESSURE SHOCK LOADING Abstract Only
J. R. Asay *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 176 (For primary document see N84-24833 15-31)
(Contract DE-AC04-76DP-00789)
Avail: NTIS HC A16/MF A01 CSCL 20/11

N84-25407# Jiwaji Univ., Gwahor (India). School of Studies in Mathematics.
AN EPICYCLOIDAL HOLE UNDER UNIFORM TANGENTIAL FORCE IN AN INFINITE, ISOTROPIC, COMPRESSIBLE MEDIUM IN SECOND ORDER ELASTICITY
M. Lal and R. S. Sikarwar *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 107-114 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

N84-25417# Middle East Technical Univ., Ankara (Turkey). Dept. of Mechanical Engineering.
FREE VIBRATION ANALYSIS OF UNIFORM AND NONUNIFORM CANTILEVER BEAMS BY INCLUDING THE EFFECTS OF TRANSVERSE SHEAR DEFORMATION AND ROTARY INERTIA
A. Saide Sarigul Aydin and Gueven Aksu *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 253-275 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

42 GEOSCIENCES (GENERAL)

N84-25112# Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
LOW TEMPERATURE SCIENCE. SERIES A: PHYSICAL SCIENCE
1983 187 p refs In ENGLISH and JAPANESE
(ISSN-0439-3538) Avail: NTIS HC A09/MF A01

The following areas of low temperature science were addressed including the effect of ice temperature on regelation velocities; plastic deformation; behavior of snow cover on a mountain slope; spectrum analysis of snow densities; hardness of snow; water balance in a watershed; and characteristic of snow cover on sea ice. For individual titles, see N84-25113 through N84-25126.

N84-25113# Hokkaido Univ., Sapporo (Japan).
THE EFFECT OF ICE TEMPERATURE ON REGELATION VELOCITIES **c70**
Shin Tozuka and Gorow Wakahama *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 1-9 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

Under the conditions of slow regelation a combination of two machanisms (viscous flow of water in a liquid layer around the wire and the creep properties of ice) was capable of quantitatively explaining the effects of ice temperature, applied pressure, and the size of a wire on regelation velocity. Author

N84-25114# Hokkaido Univ., Sapporo (Japan).
PLASTIC DEFORMATION OF ICE SINGLE CRYSTALS CONTAINING INCLUSIONS **c70**
Masayuki Hashimoto and Gorow Wakahama *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 11-19 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

Debris-rich ice layers are often found near the bed and the terminus of glaciers. In order to investigate the effect of inclusions such as debris on the plastic deformation of ice, creep tests were conducted on artificial polycrystalline ice containing sand particles. However, as the inclusions are located on crystal boundaries, the polycrystalline ice is not suitable for investigating the effect of the inclusions. Therefore, ice single crystals were used. Inclusions were glass beads whose average diameter was 58 microns. To investigate the deformation of the ice samples quantitatively, the relative velocity to one inclusion was calculated from the observed movement of other inclusions. The results for the ice containing 0.5 volume % inclusions are given. The problem of an increase in yield stress and work hardening with an increase in volume fraction of inclusions is analogous to the problem of dispersion hardened alloys. The experimental results were compared with the theoretical results of dispersion hardening. Author

N84-25115# Hokkaido Univ., Sapporo (Japan).
STUDIES OF THE BEHAVIOR OF A SNOW COVER ON MOUNTAIN SLOPE. 12: CURVES CSUBh AND CSUBv IN A WEDGE-SHAPED SNOW COVER **c43**
Zyungo Yosida *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 21-38 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

The factors within a snow cover which flows two dimensionally down a sloping ground are defined. Snow is treated as a compressible viscous fluid with plastic Poisson's ratio of various values of which the greatest is 0.5. B.G.

N84-25116# Hokkaido Univ., Sapporo (Japan).
STUDIES OF THE BEHAVIOR OF A SNOW COVER ON MOUNTAIN SLOPE. 13: CURVES CSUBh AND CSUBv IN A CIRCULAR SNOW COVER **c43**
Zyungo Yosida *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 39-56 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

Curves in circular snow covers are discussed. Gravity produces stresses in the snow cover. The upper half of the snow cover thus stressed makes a convex circular snow cover. Internal stresses in a snow cover on the mountain slope from the strain rates are calculated. B.G.

N84-25117# Hokkaido Univ., Sapporo (Japan).
MEM SPECTRUM ANALYSIS OF SNOW DENSITIES **c43**
Tamotsu Ishida and Norikazu Maeno *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 57-64 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

The maximum entropy method, abbreviated as MEM, is applied to analyses of various time series data, giving very accurate power spectra from short data. A short explanation of MEM and procedure of its calculation are given. The method of processing data in suitable forms of MEM analyses is also introduced with special reference to data of snow densities of Antarctic core samples. Author

N84-25118# Hokkaido Univ., Sapporo (Japan).
SNOW STORM WITH STRONG WIND IN ANTARCTICA **c43**
Shunichi Kobayashi and Nobuyoshi Ishikawa *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 65-79 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

A series of measurements of the mass flux of blowing snow under conditions of a strong wind and a snowfall was made on a katabatic wind slope (mean surface slope .003) at the Mizuho Station in East Antarctica. The total snow drift transport in a unit time through a unit width of the vertical surface perpendicular to the wind direction was obtained by integrating mass fluxes vertically between two given heights $Z=0$ surface and $Z=28$ m. Under the strong wind condition with a snowfall snow suspended at a higher level than under conditions of pure blowing snow, but the total snow drift transport was of the same order in both the conditions. However, the height of the suspension of snow was up to 70 m in the former, whilst it was up to 10 m in the latter. Thus, atmospheric structures were studied from the measurements of the profiles of wind speed and air temperature. Author

N84-25119# Hokkaido Univ., Sapporo (Japan).
HARDNESS OF WET SNOW, 2 **c43**
Kaoru Izumi and Eizi Akitaya *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 81-87 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

The relationship between Kinosita's hardness, free water content and dry density of wet snow, which shows that hardness of wet snow decreases increases with an increase decrease in free water content for the same dry density was presented. For several layers of wet granular snow in a natural snow cover, measurements were made of Kinosita's hardness and free water content at intervals. A change in Kinosita's hardness of snow between before and after supplying water was measured in a cold room. Two kinds of snow samples, fine-grained snow and coarse grained snow were prepared by crushing fine-grained compact snow and granular snow respectively and by redepositing them. And each sample was annealed at about 10 C for different periods of time. Then, its hardness was measured. Subsequently, the annealed snow sample was supplied with water at 0 C to the extent that water infiltrated into the body of snow sufficiently. Author

N84-25120# Hokkaido Univ., Sapporo (Japan).
STUDIES OF THE BEHAVIOR OF A SNOW COVER ON A MOUNTAIN SLOPE. 14: POISSON'S RATIO OF SNOW, 2 **c43**
Mitsuo Ohizumi and Tosio Huzioka *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 89-100 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

Using newly designed snow pressure gauges, the Poisson's ratio of snow in a snow cover on a level is measured. On a uniform slope of a mountain, lateral pressure on a plane, whose normal was in the direction of the contour line of the slope, as well as normal stress on a snow plane perpendicular to the direction of the lateral pressure is also measured. To check the inclination of the snow pressure gauge in the snow, a clinometer is set in the gauge. When the clinometer shows changes in gauge inclination from the initial reading, corrections are made to values of snow pressure using the Mohr's circle. M.A.C.

N84-25121# Hokkaido Univ., Sapporo (Japan).
ESTIMATION OF MELTING RATE OF SNOW BY SIMPLE FORMULAE USING ONLY AIR TEMPERATURE **c43**
Kenji Kojima and Hideaki Motoyama *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 101-110 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)

Avail: NTIS HC A09/MF A01

Melting rate of snow is determined by a heat balance at the surface layer of a snow cover. Radiative energy absorbed by the surface layer plays usually the most important role for the melting process. During the daytime each of the sensible and the latent heat exchange between snow and the atmosphere is less in magnitude than net radiation except under very wet and warm conditions. Practically, however, the amount of daily snowmelt is estimated by empirical formulae including only the daily mean air temperature or time-integrated air temperature above the melting point. The melted amount is often estimated by the sum of positive daily mean temperature and an empirical coefficient of proportionality. On this basis the relations, expressed variously, between the daily amount of snow melting and air temperature are reexamined using the period from December, 1979, to March, 1983. M.A.C.

N84-25122# Hokkaido Univ., Sapporo (Japan).
OPTICAL PROPERTIES OF MELTING SNOW, 1 **c43**
Nobuyoshi Ishikawa and Kenji Kojima *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 111-122 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

Radiative properties of snow are considered to have the following three main factors: reflectance, transmittance and emittance. The first two are for shortwave (optical) radiation and the last for longwave radiation. An investigation of the optical property of melting snow is of great importance for the estimation of a heat balance or internal melting amounts. Spectral reflectance of melting snow is measured by using four pyranometers with four different cutoff filters. The extinction amounts of transmitted solar radiation through melting snow are measured by five silicon photo cells. The snow cover during these observational times was characterized by coarse rained granular snow. Transmitted solar radiation was measured through the melting snow layer near the surface. M.A.C.

N84-25123# Hokkaido Univ., Sapporo (Japan).
WATER BALANCE AT A SMALL WATERSHED DURING THE SNOWMELT SEASON, 1 **c43**
Hideaki Motoyama and Daiji Kobayashi *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 123-133 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

It is necessary to preestimate the amount of snowmelt runoff in a snowy region during the melting period in order to make efficient use of runoff water and forestall damage due to a snowmelt flood. A vital prerequisite for it is to clarify the water balance of a watershed. In a small watershed the total amount of water equivalent of a snow cover, snowmelt and runoff are observed during the snowmelt period. Some characteristics of the water balance are found, and the following results obtained. (1) The total amount of snow in the watershed is estimated using a linear relation between altitude and snow cover and observed data at some places in the area. About 90 to 95% of the total amount of snow cover in the watershed ran off as stream water. (2) The amount of snowmelt equals the snowmelt runoff without a change in water storage of the watershed. This is a fairly simple relationship indicating that the runoff coefficient is nearly 1. (3) The rate of evaporation and that of condensation at the surface of the snow cover is observed or calculated using an experimental formula and found to contribute less than 1% of the total input to the watershed. M.A.C.

N84-25124# Hokkaido Univ., Sapporo (Japan).
WATER BALANCE AT A SMALL WATERSHED DURING THE SNOWMELT SEASON. 2: RUNOFF ANALYSIS **c43**
Hieaki Motoyama and Daiji Kobayashi *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 135-146 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

In a small watershed a runoff analysis is conducted to find out the mechanism of a relation between an input to the watershed and an output therefrom. Four methods for measuring the melting rate are used: (1) Snow stake method; (2) Snow lysimeter method: (3) Snow pit observation; and (4) Heat balance calculation. A tank model is used to simulate for the runoff model which consist of a series of two tanks with three runoff parts and one or two infiltration parts. The attenuation constants of the recession curve in the hydrograph are applied to the determination of the coefficients of runoff rates of the tank structure. Using the observed snowmelt and precipitations for the values of input to the watershed, the estimated snowmelt runoff snowmelt runoff is calculated. Because the observed runoff and estimated runoff data agree well, this analysis succeeded without changing the tank structure. The data of daily mean temperature and precipitation is used and the amount of snowmelt is estimated using the degree day method. The estimated snowmelt runoff is also calculated. M.A.C.

N84-25125# Hokkaido Univ., Sapporo (Japan).
SIMULTANEOUS OBSERVATION OF SNOWFALL INTENSITY AND VISIBILITY IN WINTER AT SAPPORO **c43**
Yasushi Fujiyoshi, Gorow Wakahama, Tatsuo Endoh, Shinri Irikawa, Hiroyuki Konishi, and Masao Takeuchi *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 147-156 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

Snowfall intensity R(mm/h) and visibility V(km) are simultaneously observed using an attenuation meter in measurements of visibility. The whole values of R and V satisfy approximately the following relation: $V(km) = 1.0R$ to the negative two thirds power (mm/h) Changes in V/R relation with types of snow clouds as well as snow particles are then investigated. V varies almost in proportion to R to the negative two thirds when graupel particles or snowflakes fell. The magnitude of the visual range seemed to vary with types of snow particles and also snow crystals when both had the same snowfall intensity. The visual range is largest when falling snowflakes are composed of an assemblage of bullets, crossed plates and columns. It is also large when graupel particles fell. The smallest visual range is observed when falling snowflakes are composed of dendrites; and dependence of the visual range on the degree of riming of dendrites is not clear. A discussion is made of a possibility of obtaining information on the shape of snow particles from observations of visibility and size distribution of snow particles. M.A.C.

N84-25126# Hokkaido Univ., Sapporo (Japan).
CHARACTERISTICS OF SNOW COVER ON SEA ICE AND FORMATION OF SNOW ICE **c43**
Takatoshi Takizawa *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 157-162 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

Field experiments are carried out to investigate the characteristics of the snow cover on sea ice and the snow ice formation process. A test pool is made by removing ice blocks from the fast ice sheet with a thickness of about 24 cm. A thin snow cover on the newly formed sea ice in the pool was flooded with the brine which was pushed out to the ice surface; then the snow became wet and slush like. The wet snow had a salinity of 32.5%, which was higher than that of sea water. On the day after it stopped snowing, the wet snow was refrozen into a snow ice, which had a salinity of about 20%. This decrease in salinity indicates that a fair amount of brine was excluded from the snow while the snow ice was formed. The brine exclusion from the wet snow took place whether the snow ice was formed or not. The wet snow in the pool keeps the salinity of about 20% while the salinity of snow ice in the pool decreases eventually to about 8%. M.A.C.

N84-25127# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
RELATING GEOID ANOMALIES, GRAVITY ANOMALIES AND OCEAN TOPOGRAPHY Final Report, 26 Jan. 1982 - 30 Sep. 1983
J. E. Martine 31 Dec. 1983 24 p .
(Contract F19628-82-K-0029; AF Proj. 7600)

(AD-A140112; BC-SDAL-83-1; AFGL-TR-84-0023) Avail: NTIS HC A02/MF A01 CSCL 08/5

Several techniques have been used to study the relationship between SEASAT deduced geoid anomalies, ocean-floor topography and gravity anomalies. Included are an integration formula for calculating geoid anomalies from density inhomogeneities in the ocean floor, a predictive algorithm based on admittance or the ratio of Fourier Transforms, a second predictive algorithm based on determining coefficients for a covariance filter and four formulae or mathematical models for calculating gravity anomalies from measured geoid anomalies. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-25128*# Texas Univ., El Paso. Dept. of Geological Sciences.

APPLICATION OF MAGSAT TO LITHOSPHERIC MODELING IN SOUTH AMERICA. PART 2: SYNTHESIS OF GEOLOGIC AND SEISMIC DATA FOR DEVELOPMENT OF INTEGRATED CRUSTAL MODELS Final Report

G. R. Keller, E. G. Lidiak, W. J. Hinze, L. W. Braile, and R. R. B. vonFrese, Principal Investigators Jan. 1984 485 p refs Prepared in cooperation with Purdue Univ., Lafayette, Ind. and Pittsburgh Univ. ERTS

(Contract NAS5-26326)

(E84-10126; NASA-CR-172801; NAS 1.26:172801) Avail: NTIS HC A21/MF A01 CSCL 08B

Research activities performed on MAGSAT scalar data over South America, Central America, and the adjacent marine areas are summarized. The geologic utility of magnetic anomalies detected by satellite is demonstrated by focusing on the spherical-Earth interpretation of scalar MAGSAT data in combination with ancillary geological and geophysical data to obtain lithospheric models for these regions related to their contemporary crustal dynamics processes, geologic history, current volcanism seismicity and natural resources. For individual titles, see N84-25129 through N84-25139.

N84-25129*# Purdue Univ., Lafayette, Ind.

EURO-AFRICAN MAGSAT ANOMALY-TECTONIC OBSERVATIONS Abstract Only c46

W. J. Hinze, R. R. B. vonFrese, Principal Investigators (Ohio State Univ., Columbus), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 25-26 ERTS (For primary document see N84-25128 15-43)

Avail: NTIS HC A21/MF A01 CSCL 08G

Preliminary satellite (MAGSAT) scalar magnetic anomaly data are compiled and differentially reduced to radial polarization by equivalent point source inversion for comparison with tectonic data of Africa, Europe and adjacent marine areas. A number of associations are evident to constrain analyses of the tectonic features and history of the region. The Precambrian shields of Africa and Europe exhibit varied magnetic signatures. All shields are not magnetic highs and, in fact, the Baltic shield is a marked minimum. The reduced-to-the-pole magnetic map shows a marked tendency for northeasterly striking anomalies in the eastern Atlantic and adjacent Africa, which is coincident to the track of several hot spots for the past 100 million years. However, there is little consistency in the sign of the magnetic anomalies and the track of the hot spots. Comparison of the radially polarized anomalies of Africa and Europe with other reduced-to-the-pole magnetic satellite anomaly maps of the Western Hemisphere support the reconstruction of the continents prior to the origin of the present-day Atlantic Ocean in the Mesozoic Era. A.R.H.

N84-25130*# Pittsburgh Univ., Pa.

CORRELATION OF TECTONIC PROVINCES OF SOUTH AMERICA AND THE CARIBBEAN REGION WITH MAGSAT ANOMALIES Abstract Only c46

E. G. Lidiak, W. J. Hinze (Purdue Univ., Lafayette, Ind.), G. R. Keller, Principal Investigators (Texas Univ., El Paso), D. W. Yuan, and M. B. Longacre (Purdue Univ., Lafayette, Ind.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 27-28 Presented at the 10th Caribbean Geol. Conf., Cartagena, Colombia, Aug. 1983 ERTS (For primary document see N84-25128 15-43)

Avail: NTIS HC A21/MF A01 CSCL 08G

Intensities of MAGSAT scalar magnetic anomaly data correlate with the main tectonic provinces of South America and the Caribbean region. Magnetic anomalies of the continents generally have higher amplitudes than oceanic anomalies. This is particularly evident in Central America and in the shield areas of South America. The Caribbean Sea and Gulf of Mexico are underlain by prominent magnetic minima. Within these oceanic areas, linear magnetic highs correlate with topographic ridges which separate the Gulf of Mexico, the Colombian Basin, and the Venezuelan Basin. The boundaries of the Caribbean plate occur along magnetic gradients which are particularly sharp along the northern and western margins of the plate, but gradational along the southern margin where they merge with the Andean Cordillera. The anomalies along the western margin of the South American plate are also distinct and appear to be separate from those of the adjacent ocean basin. Eastern South America is characterized by magnetic anomalies which commonly extend into the Atlantic Ocean. A.R.H.

N84-25131*# SOHIO Petroleum Co., Cleveland, Ohio.

SATELLITE ELEVATION MAGNETIC AND GRAVITY MODELS OF MAJOR SOUTH AMERICAN PLATE TECTONIC FEATURES Abstract Only c46

R. R. B. vonFrese, W. J. Hinze (Purdue Univ., Lafayette, Ind.), L. W. Braile (Purdue Univ., Lafayette, Ind.), E. G. Lidiak (Pittsburgh Univ.), G. R. Keller, Principal Investigators (Texas Univ., El Paso), and M. B. Longacre (Sohio Petroleum Co.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 33 Presented at the 4th IAGA Sci. Assembly, Edinburgh, 3-15 Aug. 1981 ERTS (For primary document see N84-25128 15-43)

Avail: NTIS HC A21/MF A01 CSCL 08G

Some MAGSAT scalar and vector magnetic anomaly data together with regional gravity anomaly data are being used to investigate the regional tectonic features of the South American Plate. An initial step in this analysis is three dimensional modeling of magnetic and gravity anomalies of major structures such as the Andean subduction zone and the Amazon River Aulacogen at satellite elevations over an appropriate range of physical properties using Gaus-Legendre quadrature integration method. In addition, one degree average free-air gravity anomalies of South America and adjacent marine areas are projected to satellite elevations assuming a spherical Earth and available MAGSAT data are processed to obtain compatible data sets for correlation. Correlation of these data sets is enhanced by reduction of the MAGSAT data to radial polarization because of the profound effect of the variation of the magnetic inclination over South America. A.R.H.

N84-25132*# Purdue Univ., Lafayette, Ind.

REDUCED TO POLE LONG-WAVELENGTH MAGNETIC ANOMALIES OF AFRICA AND EUROPE Abstract Only c46

W. J. Hinze, R. R. B. vonFrese, Principal Investigators (Ohio State Univ., Columbus), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 34 Presented at the Am. Geophys. Union Ann. Meeting, Baltimore, 1983 ERTS (For primary document see N84-25128 15-43)

Avail: NTIS HC A21/MF A01 CSCL 08G

To facilitate analysis of the tectonic framework for Africa, Europe and adjacent marine areas, MAGSAT scalar anomaly data are differentially reduced to the pole and compared to regional

geologic information and geophysical data including surface free-air gravity anomaly data upward continued to satellite elevation (350 km) on a spherical Earth. Comparative analysis shows magnetic anomalies correspond with both ancient as well as more recent Cenozoic structural features. Anomalies associated with ancient structures are primarily caused by intra-crustal lithologic variations such as the crustal disturbance associated with the Bangui anomaly in west-central Africa. Anomalies correlative with Cenozoic tectonic elements appear to be related to Curie isotherm perturbations. A possible example of the latter is the well-defined trend of magnetic minima that characterize the Alpine orogenic belt from the Atlas mountains to Eurasia. In contrast, a well-defined magnetic satellite minimum extends across the stable craton from Finland to the Ural mountains. Prominent magnetic maxima characterize the Arabian plate, Iceland, the Kursk region of the central Russian uplift, and generally the Precambrian shields of Africa. Author

N84-25133*# Purdue Univ., Lafayette, Ind.
SATELLITE MAGNETIC ANOMALIES OF AFRICA AND EUROPE Final Report c46
W. J. Hinze, R. R. B. vonFrese, Principal Investigators (Ohio State Univ., Columbus), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 35-44 refs Presented at the 52nd Ann. Intern. Meeting and Exposition of the Soc. of Exploration Geophysicists, Dallas, 1982 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08N

Preliminary MAGSAT scalar magnetic anomaly data of Africa, Europe, and adjacent marine areas were reduced to the pole assuming a constant inducing Earth's magnetic field of 60,000 nT. This process leads to a consistent anomaly data set free from marked variations in directional and intensity effects of the Earth's magnetic field over this extensive region. The resulting data are correlated with long wave length-pass filtered free-air gravity anomalies; regional heat flow, and tectonic data to investigate magatectonic elements and the region's geologic history. Magnetic anomalies are related to both ancient as well as more recent Cenozoic structural features. A.R.H.

N84-25134*# Ohio State Univ., Columbus.
DO SATELLITE MAGNETIC ANOMALY DATA ACCURATELY PORTRAY THE CRUSTAL COMPONENT? Abstract Only c46
R. R. B. vonFrese and W. J. Hinze, Principal Investigators (Purdue Univ., Lafayette, Ind.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 45 Presented at the Geomagnetic Conf., Denver, 1982 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

Scalar aeromagnetic data obtained during the U.S. Naval Oceanographic Office (NOO)-Vector Magnetic Survey of the conterminous United States were upward continued by equivalent point source inversion and compared with POGO satellite magnetic anomaly and preliminary scalar MAGSAT data. Initial comparisons indicate that the upward continued NOO data is dominated by long wavelength (approximately equal to 1000 to 3000 km) anomalies which are not present in the satellite anomaly data. Thus, the comparison of the data sets is poor. Several possible sources for these differences are present in the data analysis chain. However, upon removal of these long wavelengths from the upward continued NOO data, a close comparison observed between the anomalies verifies that satellite magnetic anomaly data do portray the crustal component within a range of wavelengths from roughly 1000 km down to the resolution limit of the observations. Author

N84-25135*# Ohio State Univ., Columbus.
LONG-WAVELENGTH MAGNETIC AND GRAVITY ANOMALY CORRELATIONS OF AFRICA AND EUROPE Abstract Only c46
R. R. B. vonFrese, W. J. Hinze, Principal Investigators (Purdue Univ., Lafayette, Ind.), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 46 Presented at the 17th IUGG Gen. Assembly, Hamburg, 1983 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

Preliminary MAGSAT scalar magnetic anomaly data were compiled for comparison with long-wavelength-pass filtered free-air gravity anomalies and regional heat-flow and tectonic data. To facilitate the correlation analysis at satellite elevations over a spherical-Earth, equivalent point source inversion was used to differentially reduce the magnetic satellite anomalies to the radial pole at 350 km elevation, and to upward continue the first radial derivative of the free-air gravity anomalies. Correlation patterns between these regional geopotential anomaly fields are quantitatively established by moving window linear regression based on Poisson's theorem. Prominent correlations include direct correspondences for the Baltic Shield, where both anomalies are negative, and the central Mediterranean and Zaire Basin where both anomalies are positive. Inverse relationships are generally common over the Precambrian Shield in northwest Africa, the Basins and Shields in southern Africa, and the Alpine Orogenic Belt. Inverse correlations also presist over the North Sea Rifts, the Benue Rift, and more generally over the East African Rifts. The results of this quantitative correlation analysis support the general inverse relationships of gravity and magnetic anomalies observed for North American continental terrain which may be broadly related to magnetic crustal thickness variations. A.R.H.

N84-25136*# Ohio State Univ., Columbus.
US AEROMAGNETIC AND SATELLITE MAGNETIC ANOMALY COMPARISONS Abstract Only c46
R. R. B. vonFrese, W. J. Hinze (Purdue Univ., Lafayette, Ind.), L. W. Braile, Principal Investigators (Purdue Univ., Lafayette, Ind.), and J. L. Sexton (ARCO) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 50-51 Presented at the 4th IAGA Sci. Assembly, Edinburgh, 3-15 Aug. 1981 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

Scalar aeromagnetic data obtained by the U.S. Naval Oceanographic Office (NOO) Vector Magnetic Survey of the conterminous U.S. were screened for periods of intense diurnal magnetic activity and reduced to anomaly form, filtered, and continued upward. A number of correlations between the NOO, POGO and preliminary MAGSAT data are evident at satellite elevations, including a prominent transcontinental magnetic high which extends from the Anadarko Basin to the Cincinnati Arch. The transcontinental magnetic high is breached by negative anomalies located over the Rio Grande Rift and Mississippi River Aulacogen. Differentially reduced-to-pole NOO and POGO magnetic anomaly data show that the transcontinental magnetic high corresponds to a well-defined regional trend of negative free-air gravity and enhanced crustal thickness anomalies. A.R.H.

N84-25137*# Pittsburgh Univ., Pa. Dept. of Geology and Planetary Science.
RELATION OF MAGSAT ANOMALIES TO THE MAIN TECTONIC PROVINCES OF SOUTH AMERICA Final Report c46
E. G. Lidiak, G. R. Keller, Principal Investigators (Texas Univ., El Paso), D. W. Yuan, and M. B. Longacre (Purdue Univ., Lafayette, Ind.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 52-58 Presented at the 52nd Ann. Intern. Meeting and Exposition of the Soc. of Exploration Geophysicists, Dallas, 1982 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

Comparison of MAGSAT scalar magnetic anomaly data to the main tectonic provinces and boundaries of South America reveals a number of geologic correlations. South America is divisible into a broad platform of Precambrian shields and cratons separated by Phanerozoic basins, grabens and aulacogens to the east, the Phanerozoic Patagonian Platform to the south, and the Mesozoic to Cenozoic Andean Fold Belt and Caribbean Mountain System to the west and north. The continental shields are mainly more

magnetic then continental basins and orogenic belts. Cratons, mainly covered by younger sedimentary rocks, are generally associated with magnetic gradients. Most of the anomalies associated with the Patagonian Platform are positive and have higher amplitudes eastward away from the Andean Fold Belt. The northern Andes are coincident with positive magnetic anomalies, whereas the central and southern Andes are associated mainly with negative anomalies. A.R.H.

N84-25138*# Pittsburgh Univ., Pa.
RELATION OF MAGSAT AND GRAVITY ANOMALIES TO THE MAIN TECTONIC PROVINCES OF SOUTH AMERICA M.S. Thesis **c46**
Ding-Wen Yuan *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 177 p refs ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

Magnetic anomalies of the South American continent are generally more positive and variable than the oceanic anomalies. There is better correlation between the magnetic anomalies and the major tectonic elements of the continents than between the anomalies and the main tectonic elements of the adjacent oceanic areas. Oceanic areas generally show no direct correlation to the magnetic anomalies. Precambrian continental shields are mainly more magnetic than continental basins and orogenic belts. Shields differ markedly from major aulacogens which are generally characterized by negative magnetic anomalies and positive gravity anomalies. The Andean orogenic belt shows rather poor correlation with the magnetic anomalies. The magnetic data exhibit instead prominent east-west trends, which although consistent with some tectonic features, may be related to processing noise derived from data reduction procedures to correct for external magnetic field effects. The pattern over the Andes is sufficiently distinct from the generally north trending magnetic anomalies occurring in the adjacent Pacific Ocean to separate effectively the leading edge of the South American Plate from the Nazea Plate. Eastern South America is characterized by magnetic anomalies which commonly extend across the continental margin into the Atlantic Ocean.
A.R.H.

N84-25139*# Texas Univ., El Paso.
A CRUSTAL STRUCTURE STUDY OF SOUTH AMERICA M.S. Thesis **c46**
Kevin Scott Renbarger *In its* Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 261 p refs ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

Variations in the average crustal thickness of the South American platform were determined by measuring fundamental mode Rayleigh wave dispersion between nine pairs of South American WWSSN seismograph stations and inverting the measurements to obtain average shear wave velocity-depth models across the platform. Additional models were derived from the Rayleigh wave dispersion data previously measured over eastern South America. Both sets of models were interpreted in terms of average crustal thickness and average crustal shear wave velocity. The results obtained were depicted in a contour map of crustal thickness. Average values for seismic velocities in the crust and upper mantle were calculated and compared with maps of regional gravity models, MAGSAT magnetic anomalies, and major tectonic features. The correlations and relationships discovered are discussed. A.R.H.

N84-25140*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY ON SPECTRAL/RADIOMETRIC CHARACTERISTICS OF THE THEMATIC MAPPER FOR LAND USE APPLICATIONS Quarterly Status Technical Progress Report, 21 Dec. 1983 - 20 Mar. 1984
William A. Malila, Principal Investigator Apr. 1984 29 p refs ERTS
(Contract NAS5-27346)
(E84-10130; NASA-CR-172805; NAS 1.26:172805; ERIM-16400-10-P) Avail: NTIS HC A03/MF A01 CSCL 08B

An information theoretic measure of multispectral information content is developed and applied to a simultaneous LANDSAT TM and MSS data set. The entropy based function measures the dispersion and concentration of signal values in various data spaces, irrespective of specific class memberships. It is used to compare the information content of TM and MSS and of various subsets of TM and MSS bans, as well as tasseled cap transformations of the band values. Differences exist between the information measure results and results using variance based measures. System design information capacities and data space volumes are also compared. The results and observations presented are considered preliminary in nature since only one real and one simulated data set are analyzed. M.A.C.

N84-25141*# Washington Univ., Seattle. Polar Science Center.
REMOTE SENSING OF FLOE SIZE DISTRIBUTION AND SURFACE TOPOGRAPHY Final Report
D. A. Rothrock and A. S. Thorndike [1984] 144 p refs ERTS (Grant NAG5-160)
(E84-10132; NASA-CR-175155; NAS 1.26:175155) Avail: NTIS HC A07/MF A01 CSCL 08L

Floe size can be measured by several properties p- for instance, area or mean caliper diameter. Two definitions of floe size distribution seem particularly useful. F(p), the fraction of area covered by floes no smaller than p; and N(p), the number of floes per unit area no smaller than p. Several summertime distributions measured are a graph, their slopes range from -1.7 to -2.5. The variance of an estimate is also calculated. M.A.C.

N84-25142*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
VEGETATION, LAND-USE AND SEASONAL ALBEDO DATA SETS: DOCUMENTATION OF ARCHIVED DATA TAPE
Elaine Matthews May 1984 13 p ref ERTS
(E84-10133; NASA-TM-86107; NAS 1.15:86107) Avail: NTIS HC A02/MF A01 CSCL 05B

Global data bases of vegetation, land use, and land cover were compiled at a 1 deg latitude x 1 deg longitude resolution, drawing on approximately 100 published sources complemented by a large collection of satellite imagery. Six datasets prepared and archived at NCAR are described: a vegetation data set (VEGTYPE) representing natural (pre-agricultural) vegetation based on the UNESCO classification system; a cultivation intensity data set (CULTINT) defining the areal extent (expressed as %) of presently cultivated land in the 1 x 1 cells; and four integrated surface-albedo data sets (January, April, July, October) for snow-free conditions except for permanently snow-covered continental ice, incorporating natural vegetation and cultivation characteristics from the vegetation and cultivation-intensity data sets. Non-zero data are included for permanent land only, including continental ice. Documentation of the data-tape format as well as descriptions and regional maps of the individual data sets are presented. A.R.H.

N84-25143# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ORBITAL IMAGERY: A CARTOGRAPHIC SOLUTION [IMAGENS ORBITAIS: UMA SOLUCAO CARTOGRAFICA]
Paulo Cesar Gurgel deAlbuquerque Jul. 1983 42 p refs In PORTUGUESE; ENGLISH summary
(INPE-2820-PRE/374) Avail: NTIS HC A03/MF A01

The use of cartography in orbital remote sensing is a useful tool to creating solutions for its immediate problems, specially those related to countries which have poor knowledge of their territorial characteristics. Satellite sensing data of first natural resources furnished the elements of cartography charts and maps. The use of the orbital data, specially the MSS imagery is presented. It is shown how available orbital data are used by cartography to correlate areas, such as those of planning where general aspect must be understood as a primary necessity to obtain reliable results. E.A.K.

N84-25144# European Space Agency, Frascati (Italy).
PROCEEDINGS OF THE FOURTH MEETING OF THE LANDSAT TECHNICAL WORKING GROUP (LTWG), VOLUME 1
Apr. 1983 49 p Meeting held at Frascati, Italy, 19-21 Apr. 1983 2 Vol.
(LIB-PRO-0012-Vol-1) Avail: NTIS HC A03/MF A01

The performance of LANDSAT remote sensing and data transmission systems is assessed and methods are discussed for radiometric and geometric correction. Standard formats for data products and options for LANDSAT 4 tm data distribution to ground stations are considered. Author

N84-25145# World Meteorological Organization, Geneva (Switzerland).
GUIDE TO HYDROLOGICAL PRACTICES. VOLUME 2: ANALYSIS, FORECASTING AND OTHER APPLICATIONS
1983 293 p refs
(WMO-168; ISBN-92-63-14168-1) Avail: NTIS MF A01; print copy available at WMO, Geneva, SWFR 40

Methods of analysis used in hydrology are discussed. The interpretation of precipitation data, including storms, rainfall frequency and intensity, and snowmelt is discussed. Stream flow data interpretation, evaporation, and evapotranspiration, runoff relations, and the modeling of hydrological systems are discussed. R.J.F.

N84-25146# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.
PHOTOGRAMMETRIC RESEARCH [FOTOGRAMMETRISKA MEDDELANDEN]
1983 206 p refs
(Trita-Fmi-47) Avail: NTIS HC A10/MF A01

The following topics are addressed: geometrical testing of x-y plotters; the question of accuracy in transition from analog to analytic photogrammetry; digital elevation models; adjustment problems and accuracy problems in analytical photogrammetry; and testing of instruments and non-topographical applications of photogrametry. For individual titles, see N84-25147 through N84-25155.

N84-25147# Royal Inst. of Tech., Stockholm (Sweden).
PHOTOGRAMMETRIC RESEARCH AT THE ROYAL INSTITUTE OF TECHNOLOGY, STOCKHOLM, SWEDEN
Kennert Torlegaard *In its* Photogrammetric Res. 1983 9 p refs (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

During the past few years the special weight was placed on analytic photogrammetry, computer-aided stereo-mapping, and special applications. With this in mind stress was placed on the acquisition of a powerful minicomputer and a number of periferal units which may be used on-line with several stereo instruments. For the period 1980 to 1984 priority is being placed on the following: analytic photogrammetry and its accuracy; map data bases and digital elevation models; cartographic remote sensing and data bases for physical planning; and non-topographic applications of photogrammetry. Author

N84-25148# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.
MATHEMATICAL ASPECTS OF DIGITAL TERRAIN INFORMATION. A PROGRESS REPORT FROM ISPRS WORKING GROUP III:3
Kennert Torlegaard *In its* Photogrammetric Res. 1983 3 p (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

An international experiment to compare photogrammetrically measured digital elevation models (DEM) is started. Terrain classification and mathematical aspects on planimetric data were examined. Author

N84-25149# Royal Inst. of Tech., Stockholm (Sweden).
DESIGN OF INTERACTIVE GRAPHICS FOR DIGITAL ELEVATION MODEL (DEM) SAMPLING c61
Anders Oestman *In its* Photogrammetric Res. 1983 11 p refs (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

The sampling of data is an essential part of a system for digital elevation models (DEM). The communication between the operator and the computer, concerning the data is important for the sampling procedure, where the sampled points are to describe the elevation of the terrain with sufficient accuracy (precision, fidelity and reliability). Since the amount of data are normally rather high, interactive computer graphics seems to be a good tool for this communication process. Aspects of interactive graphics for DEM sampling, such as data structures, graphic algorithms including approximation methods, languages for communication and decisions concerning file management systems and data base management systems are discussed. Author

N84-25150# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.
CORRELATING AERIAL PHOTOGRAPHS TO LANDSAT MULTISPECTRAL SENSOR (MSS) DATA TO MEASURE GROUND CONTROL POINTS
Lars Larsson and Haakan Malmstroem *In its* Photogrammetric Res. 1983 8 p refs (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

The geometric rectification of MSS-data (MSS = Multi Spectral Sensor) is studied to improve the accuracy. This improvement is done by using an aerial photograph as a step between the MSS-data and the GCP (Ground Control Points) in the map coordinate system. Aerial photographs digitized to higher resolution than LANDSAT can after resampling to LANDSAT pixel size be positioned in the LANDSAT-scene using digital image correlation. The photograph coordinates are also transformed to the map coordinate system. With this sequence of transformations MSS-data in the map coordinate system are calculated without having to manually define GCP in the digital image. By moving the resampling grid net when resampling the aerial photography to LANDSAT pixel size we try to improve the correlation to subpixel accuracy. Author

N84-25151# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.
GENERAL TRIANGULATION: INCORPORATING PHOTOGRAMMETRIC AND OTHER OBSERVATIONS
Rune Larsson *In its* Photogrammetric Res. 1983 10 p refs Presented at ISP Comm. 3 Symp., Helsinki, 7-11 Jun. 1982 and 9th Nordic Geodetic Meeting, Gaevle, Sweden, 13-17 Sep. 1982 (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

The facilities of and the possibilities with the GENTRI adjustment system are described. The underlying principles and data structures are explained. Several types of observations can be entered in the system and a few of them are discussed. The general way to treat observations handles such extra observations as lake surfaces, statoscope observations, flight platform orientation, slope distances, height differences, angle measurements and observations of any parameter in the solution. Results from testruns with a few of these observations implemented are presented. A preview of the possibilities to detect blunders and predict reliability is also discussed. Author

N84-25152# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.
GENTRI: A SYSTEM FOR SIMULTANEOUS ADJUSTMENT OF PHOTOGRAMMETRIC AND OTHER OBSERVATIONS
Rune Larsson *In its* Photogrammetric Res. 1983 10 p refs Presented at ISP Comm. 5 Symp., York, England, 5-10 Sep. 1984 (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

The program and data structures as realized in the GENTRI system are reported. Implementation and results from some tests using real data and further modifications by adding new types of information are discussed. Author

N84-25153# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.
THE QUESTION OF ACCURACY IN THE TRANSITION FROM ANALOGUE TO ANALYTIC PHOTOGRAMMETRY
Kennert Torlegaard *In its* Photogrammetric Res. 1983 19 p refs (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

In Sweden, photogrammetric detail measurement is performed exclusively with analog instruments of type WILD A7, A8, B8, A10, Jena Stereometrograph, Gallileo Stereosimplex, etc. In these instruments a stereoscopic model, similar to the terrain, and oriented in the ground coordinate system, is reconstructed either optically or mechanically. Measurement is characterized by the fact that each single model, covering a particular portion of the terrain is dealt with individually, resulting in a map with both planimetric details and contours for that particular area. In the case of orthophoto production, profiles are measured in each individual model. In the case of engineering planning it is often so that digital elevation models, derived from individual stereoscopic models in analog instruments, are used. The result, when, for example, the Gigas-Zeiss system with so-called profile plates for the measuring of orthophoto profiles is used, will be graphical, while the result will be digital if, for example, the WILD OR1 orthophoto projector is used. Author

N84-25154# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Photogrammetry.
MULTI-MODELS TO INCREASE ACCURACY
Kennert Torlegaard *In its* Photogrammetric Res. 1983 109 p refs (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

Classical theory of error for photogrammetry divides errors in three groups: blunders, systematic errors and random errors. Systematic errors are caused by the lacking fidelity of the functional part of the mathematical model to the real geometric relations. Block adjustment with additional parameters, multiple photographic coverage and snooping after blunders provide results with high reliability, fidelity and precision. Results based on multi-models formed by averaging two or more single stereo-models are presented. The comprising single models are calculated without correction to lens distortion, atmospheric refraction and earth curvature. The improvement of accuracy by forming multi-models is studied. The precision of photogrammetric stereo-models is decomposed into components related to ground coordinates, image coordinates and image motion due to aircraft speed. The multi-model method provides an increase of the accuracy which is similar to the additional parameters in photogrammetric block adjustment, because both methods are based on multiple photographic coverage. Author

N84-25155# Royal Inst. of Tech., Stockholm (Sweden).
GEOMETRICAL TESTING OF X, Y PLOTTERS **c35**
Kennert Torlegaard *In its* Photogrammetric Res. 1983 24 p (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

The statistical accuracy of plotters is determined by drawing a grid and then remeasuring it. If the plotting area is rectangular 40 grid points are used, if square, 25. Errors due to instability in the material on which the grid is drawn, and errors in the control measurements are eliminated. The accuracy of the plotter is determined, along with the two systematic errors, lack of orthogonality, and difference in scale between the axes, as well as the point standard error which is a measure of the magnitude of random errors. The method is described in detail both in theory and by means of an example. Author

N84-25156# Research Inst. of National Defence, Linkoeping (Sweden).
CONTOUR-TO-GRID TRANSFORMATION: DEVELOPMENT OF A METHOD FOR GENERATION OF A SPARSE GRID STRUCTURE OUT OF TERRAIN ELEVATION CONTOURS
Bengt Schmeling and Erland Jungert Dec. 1983 34 p refs (Grant STU-83-3307)
(FOA-C-30349-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

A method to transform elevation lines on a geographical map into a sparse, equidistant grid structure is described. Only those points in the grid that are closest to the elevation lines are recorded together with their elevation, which is calculated by interpolation. The important issue is to choose the distance between the grid points in such a way that: (1) no relevant information in the elevation lines will be lost; and (2) the amount of recorded grid points will be minimized. Test runs of a SIMULA program based on this method show that 12.5 meters is a suitable distance between the grid points. E.A.K.

N84-25157# Sandia Labs., Albuquerque, N. Mex.
DIAGNOSTIC TOOLS FOR MAPPING CALIFORNIA EOR PROCESSES
A. J. Leighton (Leighton Consulting Offices, Walnut Creek, Calif.) and J. R. Wayland 1984 17 p refs Presented at Soc. of Petroleum Engr. California Regional Meeting, Long Beach, Calif., 11 Apr. 1984
(Contract DE-AC04-76DP-00789)
(DE84-006232; SAND-84-0210C; SPE-Paper-12813; CONF-840495-1) Avail: NTIS HC A02/MF A01

Techniques which use wave properties were developed or adapted for measuring fluid injection fronts in assisted oil recovery processes. Tracer and pressure transient tests are used increasingly to track and diagnose problems in these processes. Diagnostic tools for mapping EOR processes are summarized, each technique and its strengths and weaknesses are described. Conditions for most advantageous application are given. The selection of a suite of mapping and diagnostic techniques for an EOR project are considered. The selection process is illustrated by three hypothetical examples which are typical for operations in larger California oil fields. The techniques are nost effective when used in combinations and conjunction with all other reservoir information. DOE

N84-25158# Pacific Northwest Lab., Richland, Wash.
MEASUREMENT OF UNSATURATED FLOW BELOW THE ROOT ZONE AT AN ARID SITE
R. R. Kirkham and G. W. Gee Dec. 1983 26 p refs Presented at Natl. Water Well Assoc. Conf. on Characterization and Monitoring of the Vadose Zone, Las Vegas, Nev., 8 Dec. 1983
(Contract DE-AC06-76RL-01830)
(DE84-006575; PNL-SA-11629; CONF-831270) Avail: NTIS HC A03/MF A01

Moisture content changes below the root zone of a grass covered area at the Hanford Site in Washington State were measured and it was determined that drainage exceeded 5 cm or 20% of the total precipitation for November 1982 through October 1983. The moisture content at all depths in the soil reached a maximum and the monthly average potential evapotranspiration reached a minimum during this period of time. Grass roots were not found below 1 m, and it was assumed that moisture changes below 1 m are entirely due to drainage. The large amount of drainage from this arid site is attributed to rainfall distribution pattern, shallow root zone, and soil drainage characteristics. Unsaturated flow model simulations predicted about 5 cm drainage from the grass site. Improvements in the comparisons between measured and predicted drainage are anticipated with field measured hydraulic properties and more realistic estimates of grass cover transpiration. It is concluded that under conditions where the majority of the rainfall occurs during periods of low potential evaporation and where soils are coarse textured, significant drainage occurs from the root zone of vegetated areas at Hanford or similar arid zone sites. DOE

N84-25159# National Commission on Libraries and Information Science, Washington, D. C. Panel on the Information Policy Implications of Archiving Satellite Data.
PRESERVE THE SENSE OF EARTH FROM SPACE
Dec. 1983 84 p refs

(DE84-900854; NP-4900854) Avail: NTIS HC A05/MF A01

The information policy implications of archiving satellite data, which was convened by the National Commission on Libraries and Information Science in September 1983 are reported. The archiving requirements that should be imposed in the event of a transfer of the US land remote sensing satellite systems to the private sector are considered. Recommendations are made to the archiving requirements that should be included in the government's request for proposals (RFP) from potential bidders. DOE

N84-25160# Delft Hydraulics Lab. (Netherlands).
OPTMIZATION OF BREAKWATER LENGTHS IN RELATION TO WAVE PENETRATION
R. L. Groeneveld (PRC International, Netherlands), F. C. Vis, and J. Vandenberg (PRC International, Netherlands) Sep. 1983 17 p refs
(Publ-312) Avail: NTIS HC A02/MF A01

In general, breakwaters are high cost items in port construction. Minimum length together with adequate protection of port and operations is beneficial to capital investment. A systematic approach is required to balance all factors in the economic optimization process. Many of the aspects involved in the evaluation of port layouts with respect to breakwater length are reviewed. The length of the breakwater is of extreme importance as it provides protection of vessels at berth from wave action. Wave penetration into the port basin was studied by means of numerical and physical models. With the numerical models at a network of points inside the port, the effects of wave refraction and diffraction around breakwater heads as well as the influence of wave reflection were computed. In the hydraulic models, actual wave penetration was defined. To this effect, wave heights were measured at a number of selected points. The results of both approaches to the problem were correlated in order to obtain the highest degree of accuracy. From these results, further studies of the operational conditions for cargo handling and vessel behavior inside the port can be made. R.S.F.

N84-25115# Hokkaido Univ., Sapporo (Japan).
STUDIES OF THE BEHAVIOR OF A SNOW COVER ON MOUNTAIN SLOPE. 12: CURVES CSUBh AND CSUBv IN A WEDGE-SHAPED SNOW COVER
Zyungo Yosida *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 21-38 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25116# Hokkaido Univ., Sapporo (Japan).
STUDIES OF THE BEHAVIOR OF A SNOW COVER ON MOUNTAIN SLOPE. 13: CURVES CSUBh AND CSUBv IN A CIRCULAR SNOW COVER
Zyungo Yosida *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 39-56 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25117# Hokkaido Univ., Sapporo (Japan).
MEM SPECTRUM ANALYSIS OF SNOW DENSITIES
Tamotsu Ishida and Norikazu Maeno *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 57-64 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25118# Hokkaido Univ., Sapporo (Japan).
SNOW STORM WITH STRONG WIND IN ANTARCTICA
Shunichi Kobayashi and Nobuyoshi Ishikawa *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 65-79 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25119# Hokkaido Univ., Sapporo (Japan).
HARDNESS OF WET SNOW, 2
Kaoru Izumi and Eizi Akitaya *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 81-87 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25120# Hokkaido Univ., Sapporo (Japan).
STUDIES OF THE BEHAVIOR OF A SNOW COVER ON A MOUNTAIN SLOPE. 14: POISSON'S RATIO OF SNOW, 2
Mitsuo Ohizumi and Tosio Huzioka *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 89-100 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25121# Hokkaido Univ., Sapporo (Japan).
ESTIMATION OF MELTING RATE OF SNOW BY SIMPLE FORMULAE USING ONLY AIR TEMPERATURE
Kenji Kojima and Hideaki Motoyama *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 101-110 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25122# Hokkaido Univ., Sapporo (Japan).
OPTICAL PROPERTIES OF MELTING SNOW, 1
Nobuyoshi Ishikawa and Kenji Kojima *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 111-122 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25123# Hokkaido Univ., Sapporo (Japan).
WATER BALANCE AT A SMALL WATERSHED DURING THE SNOWMELT SEASON, 1
Hideaki Motoyama and Daiji Kobayashi *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 123-133 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25124# Hokkaido Univ., Sapporo (Japan).
WATER BALANCE AT A SMALL WATERSHED DURING THE SNOWMELT SEASON. 2: RUNOFF ANALYSIS
Hieaki Motoyama and Daiji Kobayashi *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 135-146 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25125# Hokkaido Univ., Sapporo (Japan).
SIMULTANEOUS OBSERVATION OF SNOWFALL INTENSITY AND VISIBILITY IN WINTER AT SAPPORO
Yasushi Fujiyoshi, Gorow Wakahama, Tatsuo Endoh, Shinri Irikawa, Hiroyuki Konishi, and Masao Takeuchi *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 147-156 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25126# Hokkaido Univ., Sapporo (Japan).
CHARACTERISTICS OF SNOW COVER ON SEA ICE AND FORMATION OF SNOW ICE
Takatoshi Takizawa *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 157-162 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-25161 International Inst. for Applied Systems Analysis, Laxenburg (Austria).

LIQUEFIED ENERGY GAS TERMINAL RISK: A COMPARISON AND EVALUATION
Christoph Mandl and John Lathrop Dec. 1983 62 p refs
(Contract BMFT-321/7591/RGB-8001)
(IIASA-RR-83-34; ISBN-3-7045-0067-4) Copyright. Avail: Issuing Activity

Various risk assessment procedures as they apply to liquefied energy gas (LEG) terminal siting are discussed. The risks estimated job for LEG sites are quantified and compared. R.J.F.

N84-25162*# Motorola, Inc., Phoenix, Ariz.
QUALIFICATION TESTING OF SOLAR PHOTOVOLTAIC POWERED REFRIGERATOR FREEZERS FOR MEDICAL USE IN REMOTE GEOGRAPHIC LOCATIONS Final Report
William J. Kaszeta Dec. 1982 58 p
(Contract DEN3-240)
(NASA-CR-168181; NAS 1.26:168181) Avail: NTIS HC A04/MF A01 CSCL 10B

One of the primary obstacles to the application of vaccination in developing countries is the lack of refrigerated storage. Vaccines exposed to elevated temperatures suffer a permanent loss of potency. Photovoltaic (PV) powered refrigerator/freezer (R/F) units could surmount the problem of refrigeration in remote areas where no reliable commercial power supply is available. The performance measurements of two different models of PV powered R/F units for medical use are presented. Qualification testing consisted of four major procedures: no-load pull down, ice making, steady-state (maintenance), and holdover. Both R/F units met the major World Health Organization (WHO) requirements. However, the testing performed does not provide complete characterization of the two units; such information could be derived only from further extensive test procedures. R.S.F.

N84-25163*# Solar Power Corp., Woburn, Mass.
SOLAR PHOTOVOLTAIC POWERED REFRIGERATORS/FREEZERS FOR MEDICAL USE IN REMOTE GEOGRAPHIC LOCATIONS Final Report
Ghazi Darkazalli and Gerald F. Hein Oct. 1983 98 p
(Contract DEN3-238)
(NASA-CR-168268; NAS 1.26:168268) Avail: NTIS HC A05/MF A01 CSCL 10B

One of the obstacles preventing widespread immunication against disease is the virtual absence of reliable, low maintenance refrigeration systems for storage of vaccines in remote geographic locations. A system which consists of a solar photovoltaic cell array and an integrated refrigerator/freezer-energy storage unit is discussed herein. The array converts solar radiation into direct current (DC) electricity with no moving parts and no intermediate steps. A detailed description of the refrigeration system, its design and an analysis thereof, performance test procedures, and test results are presented. A system schematic is also provided. R.S.F.

N84-25164*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PROTECTIVE TELESCOPING SHIELD FOR SOLAR CONCENTRATOR Patent Application
Maurice J. Argoud (JPL, California Inst. of Tech., Pasadena), Walter L. Walker (JPL, California Inst. of Tech., Pasadena), and Lloyd V. Butler, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 22 Feb. 1984 12 p
(Contract NAS7-100)
(NASA-Case-NPO-16236-1; US-Patent-Appl-SN-582495) Avail: NTIS HC A02/MF A01 CSCL 10A

An apparatus is described for use with a solar concentrator such as a parabolic dish which concentrates sunlight onto a small opening of a solar receiver, for protecting the receiver in the event of a system failure that could cause concentrated sunlight to damage the receiver. The protective apparatus includes a structure which can be moved from a stowed position where it does not block sunlight, to a deployed position wherein it forms a tube which substantially completely surrounds an axis connecting the receiver opening to the center of the concentrator at locations between the receiver and the concentrator. NASA

N84-25165*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SOLAR THERMAL SYSTEM ENGINEERING GUIDEBOOK Final Report, 24 Sep. 1982 - 31 May 1983
M. K. Selcuk and S. A. Bluhm Tyndall AFB, Fla. Air Force Engineering and Service Center May 1983 64 p refs
(NASA-CR-173432; JPL-PUB-83-41; NAS 1.26:173432; AD-A130951; AFESC/DEB-TR-83-03) Avail: NTIS HC A04/MF A01 CSCL 10B

This report presents a graphical methodology for the preliminary evaluation of solar thermal energy plants by Air Force base civil engineers. The report is organized as a Guidebook with worksheets and nomograms provided for rapid estimation of solar collector area, land area, energy output, and thermal power output of a solar thermal plant. Flat plate, evacuated tube, parabolic trough, and parabolic dish solar thermal technologies are considered. Author (GRA)

N84-25166*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RESULTS OF ELECTRIC-VEHICLE PROPULSION SYSTEM PERFORMANCE ON THREE LEAD-ACID BATTERY SYSTEMS
John G. Ewashinka 1984 16 p refs Presented at the 19th Intersoc. Energy Conversion Eng. Conf., San Francisco, 19-24 Aug. 1984
(Contract DE-AI01-77CS-51044)
(NASA-TM-83657; E-2015; NAS 1.15:83657; DOE/NASA/51044-36) Avail: NTIS HC A02/MF A01 CSCL 10C

Three types of state of the art 6 V lead acid batteries were tested. The cycle life of lead acid batteries as a function of the electric vehicle propulsion system design was determined. Cycle life, degradation rate and failure modes with different battery types (baseline versus state of the art tubular and thin plate batteries were compared. The effects of testing strings of three versus six series connected batteries on overall performance were investigated. All three types do not seem to have an economically feasible battery system for the propulsion systems. The tubular plate batteries on the load leveled profile attained 235 cycles with no signs of degradation and minimal capacity loss. E.A.K.

N84-25167*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ECUT: ENERGY CONVERSION AND UTILIZATION TECHNOLOGIES PROGRAM. INDUSTRY, UNIVERSITY AND RESEARCH INTEREST IN THE US DEPARTMENT OF ENERGY ECUT BIOCATALYSIS RESEARCH ACTIVITY
R. E. Wilcox 1 Nov. 1983 39 p refs
(Contract DE-AI01-81CS-66001)
(NASA-CR-173553; JPL-Pub-83-90; NAS 1.26:173553; DOE/CS-66001/3) Avail: NTIS HC A03/MF A01 CSCL 10B

The results of a Research Opportunity Notice (RON) disseminated by the Jet Propulsion Laboratory for the U.S. Department of Energy Conversion and Utilization Technologies (ECUT) Program's Biocatalysis Research Activity are presented. The RON was issued in late April of 1983 and solicited expressions of interest from petrochemical and chemical companies, bioengineering firms, biochemical engineering consultants, private research laboratories, and universities for participating in a federal research program to investigate potential applications of biotechnology in producing chemicals. The RON results indicate that broad interest exists within the nation's industry, universities, and research institutes for the Activity and its planned research and development program. Author

N84-25168*# Washington Univ., Seattle.
BASIC AND APPLIED RESEARCH RELATED TO THE TECHNOLOGY OF SPACE ENERGY CONVERSION SYSTEMS, 1982 - 1983 Final Report

Abraham Hertzberg [1983] 12 p refs
(Grant NAG3-16)
(NASA-CR-173554; NAS 1.26:173554) Avail: NTIS HC A02/MF A01 CSCL 10A

Topics on solar energy conversion concepts and applications are discussed. An overview of the current status and future utilization of radiation receivers for electrical energy generation, liquid droplet radiation systems, and liquid droplet heat exchangers is presented. M.A.C.

N84-25169*# Energy Research Corp., Danbury, Conn.
EVALUATION OF GAS-COOLED PRESSURIZED PHOSPHORIC ACID FUEL CELLS FOR ELECTRIC UTILITY POWER GENERATION Final Report
Mohammad Faroque Sep. 1983 84 p refs
(Contracts DEN3-201; DE-AI21-80ET-17088)
(NASA-CR-168298; DOE/NASA/0201-4; NAS 1.26:168298) Avail: NTIS HC A05/MF A01 CSCL 10A

Gas cooling is a more reliable, less expensive and a more simple alternative to conventional liquid cooling for heat removal from the phosphoric acid fuel cell (PAFC). The feasibility of gas-cooling was already demonstrated in atmospheric pressure stacks. Theoretical and experimental investigations of gas-cooling for pressurized PAFC are presented. Two approaches to gas cooling, Distributed Gas-Cooling (DIGAS) and Separated Gas-Cooling (SGC) were considered, and a theoretical comparison on the basis of cell performance indicated SGC to be superior to DIGAS. The feasibility of SGC was experimentally demonstrated by operating a 45-cell stack for 700 hours at pressure, and determining thermal response and the effect of other related parameters. Author

N84-25170# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Technische Physik.
DEVELOPMENT OF MEDIA FOR DYNAMIC LATENT HEAT STORAGE FOR THE LOW TEMPERATURE RANGE. PART 1: THERMAL ANALYSIS OF SELECTED SALT HYDRATE SYSTEMS
Herbert Kanwischer and Rainer Tamme Dec. 1983 76 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-84-03-Pt-1) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 23,50

Phase change temperatures and phase change enthalpies of seventeen salt hydrates, three double salts, and four eutectics were measured thermodynamically and the results reported herein. Good results were obtained, especially for congruently melting salt hydrates. Incongruently melting salt hydrates appear less suitable for heat storage applications. The influence of the second phase - water, acid, and hydroxide - to the latent heat is described. From these results, basic values of the working temperatures and storage capabilities of various storage media compositions may be derived. Author

N84-25171# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
OPERATIONAL DEMONSTRATION OF A FIELD OF HIGH PERFORMANCE FLAT PLATE COLLECTORS WITH ISOTHERMAL HEAT TRANSPORT Final Report, Dec. 1982
Veit Merges and Edgar Klippel Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 37 p Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-2; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 8

A solar plant with 21 sq m of highly efficient flat plate collectors and which requires no electricity is described. Heat transport is provided by saturated steam that condenses in a four cubic meter storage tank. The operation temperature is set by the buffer gas pressure between 100 and 140 C, and an absorption chiller is simulated as a heat consumer. The solar collectors were observed to exhibit high performance. Heat transport and temperature control offered high reliability and the thermal stratification in the tank was satisfactory. The positive result permits the design and construction of larger solar plants following the same technical principles. Author

N84-25172# Stuttgart Univ. (West Germany). Inst. of Physical Electronics.
TECHNICAL USE OF SOLAR ENERGY. PART 1. THIN FILMS SOLAR CELLS Final Report, Feb. 1982
Wolfgang Arndt, Gottfried Heinrich Bauer, Hans Ulrich Berger, Werner Heinz Bloss, Gert Helge Hewig, Fritz Pfisterer, and Hans Werner Schock Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 78 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-298-Pt-1; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 16,50

Due to the potentialities of Cu2-xS-CdS thin film solar cells, several companies installed production lines for this type of solar cell. Besides investigations for further enhancing efficiency and long-term stability, for gaining data of physical and electronical parameters, and for improving the theoretical knowledge of the cell, materials and technologies are investigated which look promising for large-scale industrial production. Solar cells with an area of 42 sq cm are realized, showing efficiencies of up to 8%; outdoor tests reveal that no system-inherent degradation mechanism exists when properly encapsulated cells are tested under realistic operation conditions. Large-area thin films of amorphous silicon with definite and reproducible properties are produced with two methods, both of which are well suited for the preparation: RF-sputtering in Ar/H2-mixtures and glow discharge in SiH4. Correlations exist between results of plasma diagnostics and analyses of the layers, allowing definite variations and an optimization of the production parameters. Various methods for the injection of different types of dopants into the plasma result in the implantation of electronically active dopants into the layers. Author

N84-25173# Stuttgart Univ. (West Germany). Inst. fuer Thermodynamik und Waermetechnik.
TECHNICAL USE OF SOLAR ENERGY: CONVERSION FROM SOLAR TO THERMAL ENERGY, SOLAR COOLING AND THERMAL ENERGY STORAGE Final Report, Feb. 1982
Abdelraouf Arafa, Norbert Fisch, Erich Hahne, Karel Kraus, Dieter Seemann, Bernardo Seifert, Jochen Sohns, Gebhart Schetter, and Wolfram Schweigerer Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 178 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-300; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 34,50

Experimental and theoretical studies in the field of solar energy utilization are reviewed. Specific topics considered are: flat plate water collectors, solar absorbers, air collectors, solar absorption cooling, solar simulators, aquifiers, latent heat stores, and space heating systems. R.S.F.

N84-25174# Germanischer Lloyd, Hamburg (West Germany).
EXAMINATION OF THE FINAL DESIGN OF THE ROTOR BLADES GROWIAN 1 Final Report, Sep. 1982
Rolf Lehmhus Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 61 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-306; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 13

The design analysis of rotor blades for the wind energy converting system GROWIAN 1 is described. Technical safety supervision of the rotor blade construction included an examination of stress and vibration calculations and of design and production data. Materials testing was also completed. The results obtained

from experimental studies of components and type tests of materials were taken into account in the overall assessment of the rotor blade design. R.S.F.

N84-25175# Resart-IMH A.G., Mainz (West Germany).
RESEARCH AND DEVELOPMENT ON THE ENCAPSULATION OF SOLAR CELLS WITH IMPROVED POTTING AND COVER MATERIALS Final Report, Apr. 1982
Erich Gruber Bonn Bundesministerium fuer Forschung und Technologie Dec. 1983 96 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-309; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20

Encapsulations materials for a full-plastic-panel consisting of a scratch resistant coated PMMA-cover, an acrylic pottant, a PMMA-substrate and an acrylic sealant were optimized. The main problems of inhibition of the redox-initiation-system, of adhesion between pottant and cover plates, and of water take up by the pottant could be solved. The optical properties of panels were improved by scratch resistant coating and by applying a diffusely reflecting substrate. Only 60 C could be reached as a longterm service temperature, tests about practical weathering conditions are made. Author

N84-25176# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
PERFORMANCE TESTS OF 4-5 YEAR OLD LITHIUM SULPHUR DIOXIDE BATTERIES
C. R. Holland and R. L. Williams Sep. 1983 28 p
(AD-A139842; NORDA-TN-239) Avail: NTIS HC A03/MF A01 CSCL 10/3

Tests of a new acoustic system in the spring of 1982, using radio frequency transmission of the data, required the Naval Ocean Research and Development Activity (NORDA) to reconsider the use of lithium battery technology. A request was made to the Navy Safety Office, Naval Sea Systems Command Code 06H, for permission to utilize lithium batteries in the R&D project and for permission to use existing lithium sulphur dioxide cells, which had been purchased in previous years. The safety office tentatively approved the intended useage but subject to a performance test and evaluation of a representative sample of the existing cells. In response to the NAVSEA direction, 32 cells were randomly chosen and subjected to forming and discharge tests. The cells, as a group, performed beyond expectations and provided energy in excess of the manufacturer's original specifications for these cells. All tests were performed without safety problems or any incidents. Similar cells from the same lot were subsequently used at sea in the R&D project and performed equally as well as those tested in the laboratory. This report documents the testing procedures used to evaluate 4 to 5 year old Li/SO2 cells and the test results achieved. GRA

N84-25177# Varian Associates, Palo Alto, Calif. Solid State Lab.
DEVELOPMENT OF MECHANICALLY-STACKED MULTIJUNCTION SOLAR CELL FOR CONCENTRATOR APPLICATIONS Final Report
R. L. Bell, R. J. Boettcher, P. G. Borden, W. T. Dietze, M. Grounner, C. R. Kaminar, C. R. Lewis, and M. J. Ludowise Feb. 1984 66 p refs
(Contract DE-AC04-76DP-00789)
(DE84-008355; SAND-83-7460) Avail: NTIS HC A04/MF A01

Development of a mechanically stacked multijunction solar cell is described. The cell uses a thin, high bandgap cell bonded to the top of a silicon cell. Two electrical leads are brought out from each cell in the stack so that the cells may be operated electrically in parallel while they are optically in series. Modeling and packaging of the cascaded cells is discussed and a process for making a thin, high bandgap AlGaAs solar cell is described. DOE

N84-25178# Sandia Labs., Albuquerque, N. Mex. Div. 6222.
SOLAR MOLTEN SALT ELECTRIC EXPERIMENT
John T. Holmes 1983 10 p refs Presented at the 6th Miami Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla., 12-14 Dec. 1983
(Contract DE-AC04-76DP-00789)
(DE84-006340; SAND-83-1021C; CONF-831205-7) Avail: NTIS HC A02/MF A01

Second generation solar power tower technology, based on using a molten nitrate salt as the solar receiver and thermal storage heat transfer fluid, is now in the final phase of preoperational testing at the Central Receiver Test Facility (CRTF) near Albuquerque, New Mexico. The Molten Salt Electric Experiment (MSEE) is a joint government, electric utility, and industry funded program that will provide performance, operation, and maintenance data for potential users and industrial supplies of the system components. The MSEE uses 221, 37 sq m (400 sq ft) heliostats, a 5 MWt solar receiver, 7 MWH thermal storage, molten salt-to-water steam generator that supplies 4700 kg/hr steam at 504 C (940 F) and 7.6 MPa (1050 psig) to a 750 kWe turbogenerator, and a digital computer based process controller. All of the components of this second generation solar technology are now available to potential users. When the MSEE is completely operational, teams of power plant operators from electric utilities will receive hands-on experience with this new technology. DOE

N84-25179# General Electric Co., Schenectady, N. Y. Corporate Research and Development Center.
CATHODE MATERIALS DEVELOPMENT FOR CARBONATE FUEL CELLS Final Report
Charles E. Baumgartner 1984 46 p refs
(Contract DE-AC05-84OR-21400)
(DE84-010033; DOE/OR-21400/T2) Avail: NTIS HC A03/MF A01

The electronic conductivity of cation doped ZnO and LiFeO2 samples was determined between 773 to 1123(0)K under a 30% CO2/air atmosphere using a 4 probe AC impedance technique. The highest conductivities recorded at 923(0)K, the operating temperature of a molten carbonate fuel cell, were 5.3 x 10(-1), 3.5 x 10(-1), and 1.5 x 10(-1) for Zn 0 942Zr0 058O, LiFe0 921Cr0 079O2, and LiFe0 930Cu0 070O2 respectively. It is found that the solubility of all materials, except LaNiO3, increased with increasing temperature for each gas system investigated, however, quantitative measurements at the lower temperatures were hindered by high elemental impurity levels in the nascent carbonate. The equilibrium solubilities of NiO, ZnO, and LiFeO2 at constant temperature varied linearly as CO2 + O2 was replaced by N2 with both ZnO and NiO showing a decreasing solubility with increasing N2 while the LiFeO2 solubility change was in the other direction. The LaNiO3 solubility remains below the quantitative detection limit until the melt's temperature exceeds 1123(0)K at which time material decomposition occurs. DOE

N84-25180# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
LOCAL ERROR ESTIMATING BY DOUBLING
L. F. Shampine Mar. 1984 24 p refs
(Contract DE-AC04-76DP-00789)
(DE84-010107; SAND-84-0413) Avail: NTIS HC A02/MF A01

Doubling, or Richardson extrapolation, which is a general principle for the estimation of the local error made by a one step method for the numerical solution of the initial value problem for a system of ordinary differential equations is outlined. Contributions made to the theory of doubling are presented. Principles of comparing explicit Runge-Kutta formulas are reviewed and illustrated in a balanced appraisal of doubling in the context of fourth order formulas. Some apparently contradictory comparisons in the literature are explained. DOE

N84-25181# Sperry Research Center, Sudbury, Mass.
SPERRY LOW TEMPERATURE GEOTHERMAL CONVERSION SYSTEM, PHASE 1 AND PHASE 2. VOLUME 6: ECONOMIC STUDIES Final Report

Claude Harvey and Warren McBee, ed. 1983 80 p 6 Vol.
(Contracts DE-AC03-78ET-27125; DE-AC03-79ET-27131)
(DE84-008039; DOE/ET-27125/T2-Vol-6; SRC-CR-83-43-Vol-6)
Avail: NTIS HC A05/MF A01

The basic thrust of the studies represented was to compare the overall economics of the Gravity Head system with that of optimized conventional binary generating plants. The study is site-specific to the East Mesa geothermal reservoir. It begins with an analysis of optimum individual well production based on the known characteristics of the reservoir. The limiting factors at East Mesa are reservoir drawdown and maximum practical brine pump impeller setting depth. Using the 1300 gpm, 360(0) F resource as a starting point, detailed cost estimates and performance calculations were made for the Gravity Head and various conventional alternative well-head systems. The most cost effective of the conventional alternatives was found to be a 700 psi cycle using R114 as the working fluid (actually optimized at 682 psi). The study is in two parts. In Part 1, emphasis is placed on the economic sensitivities of the compared systems to variations in capital cost, O and M cost, avoided energy inflation rates, and brine cost. In Part 2, a somewhat more rigorous attempt is made to derive the actual economic performance of the systems under more realistic circumstances with contingencies, cost penalties, and multiple-unit developments added. DOE

N84-25182# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
OCEAN ENERGY SYSTEMS Quarterly Report, Jan. - Mar. 1983
1983 24 p refs
(Contract DE-AI01-77ET-20342)
(DE84-005200; JHU/APL-OQR-83-1) Avail: NTIS HC A02/MF A01

Progress is reported on the development of Ocean Thermal Energy Conversion (OTEC) systems that will provide synthetic fuels (e.g., methanol), energy-intensive products such as ammonia (for fertilizers and chemicals), and aluminum. The work also includes assessment and design concepts for hybrid plants, such as geothermal-OTEC (GEOTEC) plants. Another effort that began in the spring of 1982 is a technical advisory role to DOE with respect to their management of the conceptual and preliminary design activity of industry teams that are designing a shelf-mounted offshore OTEC pilot plant that could deliver power to Oahu, Hawaii. In addition, a program is underway to evaluate and test the Pneumatic Wave-Energy Conversion System (PWECS), an ocean-energy device consisting of a turbine that is air-driven as a result of wave action in a chamber. The work on the various tasks as of 31 March 1983 is reported. DOE

N84-25183# Energy Research Corp., Danbury, Conn.
DEVELOPMENT OF MOLTEN CARBONATE FUEL CELL TECHNOLOGY Technical Progress Report, Apr. - Jun. 1983
B. Baker, M. Benedict, R. Bernard, R. Chamberlin, J. Doyon, H. Maru, J. Mahoney, L. Paetsch, P. Patel, and A. Pigeaud 1983 24 p
(Contract DE-AC02-76ET-11304)
(DE84-004856; DOE/ET-11304/28) Avail: NTIS HC A02/MF A01

The component development focused on characterization and testing of porous electrodes made by several different fabrication techniques. A relatively dense structure with narrow pore size distribution is obtained by the tape casting method in which nickel and lithium aluminate powder are intimately mixed in a slurry. Such tape cast structures showed anode creep strengths very close to the development goals. Less dense structures with a broader pore size distribution can be obtained by the ceramic impregnation method which appears to be a good candidate for stabilizing in situ oxidized cathode structures. Cell testing of tape cast anodes with both hot pressed and tape cast electrolyte matrices revealed compatibility issues which require readjustment in their characteristics. DOE

N84-25184# California Univ., Berkeley. Lawrence Berkeley Lab.
ADVANCED ELECTROCHEMICAL ENERGY STORAGE SYSTEMS
Elton J. Cairns 12 Dec. 1983 55 p refs Presented at the Royal Swedish Acad. of Eng. Sci. Energy Storage Conf., Stockholm, 12 Dec. 1983
(Contract DE-AC03-76SF-00098)
(DE84-008245; LBL-17058; CONF-831273-1) Avail: NTIS HC A04/MF A01

The requirements for stationary energy storage and for electric vehicle batteries are indicated. The field of advanced rechargeable batteries is reviewed with emphasis on the most promising systems. Status reports, problem areas, and opportunities for future development are given. Areas for special contributions from Sweden are identified. DOE

N84-25185# Argonne National Lab., Ill. Energy and Environmental Systems Div.
THERMAL ENERGY STORAGE IN MOLTEN-SALT SYSTEMS FOR SOLAR CENTRAL RECEIVERS: THE FEDERAL ROLE IN RESEARCH AND DEVELOPMENT
Allen I. Michaels and Ronald O. Mueller May 1983 32 p refs
(Contract W-31-109-eng-38)
(DE84-007433; ANL/EES-TM-240) Avail: NTIS HC A03/MF A01

The thermal energy storage for solar thermal applications (TESSTA) program, which is closely tied to a broader STES effort to develop solar central receivers, includes: exploratory research to identify and study new energy storage materials and processes and improved techniques for containing the heat storage media, which may be corrosive; base technology R and D, including component design and development and laboratory scale experimentation; and feasibility tests of large TES systems in partnership with industry. The TESSTA program emphasizes development of second generation and advanced TES systems to support solar central receivers that use either molten salt or liquid sodium as the heat transfer and exchange medium. The decisions and achievements of the TESSTA program are summarized beginning with a brief review of the central receiver program. Also discussed are the program structure and funding and the assessment of the Federal role. DOE

N84-25186# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHOTOVOLTAIC ENERGY SYSTEMS: PROGRAM SUMMARY FISCAL YEAR 1983
Jan. 1984 372 p refs Prepared in cooperation with Midwest Research Inst., Golden, Colo.
(Contracts DE-AC02-77CH-00178; DE-AI01-76ET-20356)
(DE84-009179; DOE/CE-0033/2) Avail: NTIS HC A16/MF A01

An overview of government funded activities in photovoltaic energy conversion research is given. Introductory information, a list of directing organizations, a list of acronyms and abbreviations, and an index of current contractors are given. DOE

N84-25187# Brookhaven National Lab., Upton, N. Y. Chemistry Dept.
STRATEGIES FOR SOLAR ENERGY CONVERSION UTILIZING METAL COMPLEXES
Norman Sutin 1984 15 p refs Presented at the US-Japan Inform. Exchange Seminar on Photochem. Energy Solar Conversion, Okazaki (Japan), 12 Mar. 1984
(Contract DE-AC02-76CH-00016)
(DE84-008184; BNL-34397; CONF-840389-2) Avail: NTIS HC A02/MF A01

Transition metal complexes have properties which make them particularly attractive candidates for use in solar energy conversion systems. The complexes generally absorb strongly in the visible and their excited states frequently undergo rapid electron transfer. In addition, transition metal complexes are capable of undergoing multiequivalent changes (generally required for the formation of highly reduced or oxidized species) and can be designed to have vacant or readily accessible coordination sites for the stabilization or activation of intermediates. Radiationless decays are discussed,

as well as excited state lifetimes, quenching, back reactions, and cage escape yields. The focus of the work reported is on homogeneous systems rather than heterogeneous systems. DOE

N84-25188# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Chemistry and Materials Science.
ALUMINUM-AIR POWER CELL RESEARCH AND DEVELOPMENT Progress Report
John F. Cooper 22 Feb. 1984 34 p refs Presented at the EHV Systems Assessment Seminar, Gainesville, Fla., 14-16 Dec. 1983
(Contract W-7405-eng-48)
(DE84-008328; UCRL-90465; CONF-831272-2) Avail: NTIS HC A03/MF A01

An aluminum-air battery is under development with the objective of providing an electric vehicle with the range, acceleration and rapid refueling capability of common automobiles. From tested refuelable cell designs, a wedge-shaped cell was chosen for mechanical simplicity and for its capability of full anode utilization and rapid partial- or full-recharge. The cell uses tin-plated copper tracks to maintain a constant interelectrode separation and to collect anodic current. Rectangular slabs of aluminum enter the cell under gravity feed and gradually assume the wedge shape during dissolution. The feed is constant and continuous and tin/aluminum junction losses are 7 mV at 2 kA/m(2). A second generation wedge cell was developed which incorporates air- and electrolyte-manifolding into individually-replaceable air-cathode cassettes. A prototype wedge cell using replaceable cassettes was operated simultaneously with a crystallizer, which stabilized aluminate concentration and produced a granular aluminum-trihydroxide reaction product. Electrolyte was circulated between cell and fluidized-bed crystallizer, and particles of sizes greater than 0.015 mm were retained within the crystallizer using a hydrocyclone. DOE

N84-25189# Idaho National Engineering Lab., Idaho Falls.
THERMOMAGNETIC GENERATOR
Lance Kirol, Jim Mills, and Dave VanHaaften Nov. 1983 133 p refs
(Contract DE-AC07-76ID-01570)
(DE84-007685; EGG-SE-6442) Avail: NTIS HC A07/MF A01

Cycles for producing electricity from heat utilizing the magnetocaloric effect are considered. A thermomagnetic generator producing electricity directly without a mechanical interface is studied analytically, with emphasis on low temperature (below 400 K) applications. Power density and efficiency higher than previously reported in the literature appear achievable. Areas for future investigation include identification of optimum materials and verification of heat transfer correlations. Capital cost for a thermomagnetic generator is comparable to the cost for commercially available low temperature, organic Rankine cycle generators. Cycles utilizing chemical reactions to change magnetic properties are also considered. DOE

N84-25190# Rockwell International Corp., Golden, Colo. Energy Systems Group.
SMALL WIND SYSTEMS FIELD EVALUATION. VOLUME 3: UTILITY ISSUES Final Report
Darrell M. Dodge, Judith L. Porpotage, William E. Bawn, Jr., and Joseph V. Guerrero Jul. 1983 107 p refs
(Contract DE-AC04-76DP-03533)
(DE84-006919; RFP-3562/3-Vol-3) Avail: NTIS HC A06/MF A01

Included are a compendium of utility issues and concerns regarding safety, power quality, and energy supply and economics; a summary of interconnection procedures and equipment employed during the field evaluation program (FEP); case data describing user and utility experience; and a description of data collection and analysis procedures together with an account of how major issues were addressed. No power quality or safety problems were experienced during the FEP, even though many installations were interconnected through inverters. Over 15% of the utilities in the US were personally briefed by the Rocky Flats staff. The FEP served to focus attention on key issues and began the process of reconciling utility, wind industry, and consumer interests. One major finding was that considerable design work and research was needed to improve the electrical performance and efficiency of the wind systems used in the FEP. DOE

N84-25191# National Academy of Sciences - National Research Council, Washington, D. C.
ADVANCED NUCLEAR SYSTEMS FOR PORTABLE POWER IN SPACE Final Report
1983 60 p refs
(Contract N00014-82-C-0373)
(PB84-148568; ISBN-0-309-03427-2) Avail: NTIS HC A04/MF A01 CSCL 10B

An assessment and judgment of the prospects for advanced nuclear power systems for aerospace application are given. One application, space nuclear power, has been identified for particular attention. An assessment of the need for space nuclear power and the type of research and development program that is indicated is given. It is argued that space nuclear power will be important to the future of this nation. However, until the leadtime to acquire and deploy an operational nuclear power system is shortened to match that of the space system it would support, it will not appear to be a viable technical option for responsible management. GRA

N84-24656*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SOLAR-ARRAY-MATERIALS PASSIVE LDEF EXPERIMENT (A0171)
Ann F. Whitaker, Charles F. Smith, Jr., Leighton E. Young, Henry W. Brandhorst, Jr., A. F. Forestieri, Edward M. Gaddy, James A. Bass, and Paul M. Stella *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 86-87 Prepared in cooperation with NASA. Lewis Research Center and NASA. Goddard Space Flight Center and JPL (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 10A

N84-24657*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED PHOTOVOLTAIC EXPERIMENT (S0014)
Henry W. Bradhorst, Jr. and A. F. Forestieri *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 88-90 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 10A

N84-24658*# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany). Space Div.
INVESTIGATION OF CRITICAL SURFACE DEGRADATION EFFECTS ON COATINGS AND SOLAR CELLS DEVELOPED IN GERMANY (S1002)
Ludwig Preuss *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 91-93 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 10A

N84-25596*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HELICAL ROTARY SCREW EXPANDERS TO GENERATE ELECTRICITY FROM GEOTHERMAL BRINES
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 18-19 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 10A

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-25192 International Inst. for Applied Systems Analysis, Laxenburg (Austria).

ENVIRONMENTAL MODELING UNDER UNCERTAINTY: MONTE CARLO SIMULATION
Kurt Fedra Nov. 1983 87 p refs
(Grant ARF-3905)
(IIASA-RR-83-28; ISBN-3-7045-0061-5) Copyright. Avail: Issuing Activity

Uncertainty and the reliability of Environment models and forecasts based on Monte Carlo simulation are the key concerns discussed. The use of Monte Carlo methods when the available field data are sparse and uncertain is discussed. The problem of constructing, calibrating, evaluating, and applying a model for prediction - and ultimately for management is discussed. The importance of model testability is emphasized. The close relationship between the processes of model calibration and the predictions obtained subsequently is discussed. R.J.F.

N84-25193# Committee on Science and Technology (U. S. House).
MAN AND THE BIOSPHERE PROGRAM
Washington GPO 1984 202 p refs Hearing before the Subcomm. on Natural Resources, Agr. Res. and Environ. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 60, 5 Apr. 1983
(GPO-28-292) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

An evaluation of the Man And the Biosphere (MAB) program is presented. The domestic and international programs centered on environment management, global ecology, and resource conservation are described. Current status of the MAB programs monitoring, research, education, and public relations efforts are discussed. M.A.C.

N84-25194*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-11) LAUNCH
D. L. Johnson, C. K. Hill, and G. W. Batts May 1984 51 p refs
(NASA-TM-82580; NAS 1.15:82580) Avail: NTIS HC A04/MF A01 CSCL 13B

Atmospheric conditions observed near Space Shuttle STS-11 launch time on February 3, 1984, at Kennedy Space Center, Florida are summarized. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles are reported. Wind and thermodynamic parameters representative of surface and aloft conditions in the SRB descent/impact ocean area are presented. Meteorological tapes, which consist of wind and thermodynamic parameters vesus altitude, for STS-11 vehicle ascent and SRB descent/impact were constructed. E.A.K.

N84-25195*# District of Columbia Univ., Washington, D. C.
A RESEARCH PROGRAM IN DETERMINATION OF HEAVY METALS IN SEDIMENTS AND BENTHIC SPECIES IN RELATION TO NUCLEAR POWER PLANT OPERATION Final Technical Report, 1974 - 1982
Harriette L. Phelps 1984 83 p refs
(Grant NGR-09-050-019)
(NASA-CR-173537; NAS 1.26:173537) Avail: NTIS HC A05/MF A01 CSCL 13B

Heavy metals in the estuarine environment can be toxic to fish and shellfish early life history stages and concentrations build up to levels of concern in marketable shellfish. The present survey was begun just before startup in 1974 of the 1900 megawatt Calvert Cliffs Nuclear Power Plant on the Chesapeake Bay in order to assess and understand factors relating to heavy metal accumulation in estuarine biota. Oysters were collected in large numbers at test and reference sites in June 1974 to 77 and individually analyzed for copper and zinc. Oyster copper and zinc concentrations were correlated with salinity read at time of collection. The relationship of oyster age to metal concentration was examined with two sets of oysters of known age and genetic origin (laboratory spawned). Copper sorption by typical mid Bay sediments, and field studies on cadmium concentrations in sediments were examined. B.G.

N84-25196# Gesellschaft fuer Elektrometallurgie m.b.H., Duesseldorf (West Germany).
MoO3, EX MoS2, WITH FURTHER PROCESSING OF THE METAL-BEARING WASTE SULFURIC ACID GENERATED IN THE PROCESS Final Report, Mar. 1982
Guenther Bauer, Joachim Eckert, and Hans-Joachim Retelsdorf Bonn Bundesministerium fuer Forschung und Technologie. Dec. 1983 18 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-83-297; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 4

Conversion of MoS2 concentrates of all available grades to molybdenum oxide in an autoclave without previous treatment in an oxygen leaching process was completed. The sulfuric acid produced in the process was recycled; SO4 (in form of gypsum), Cu, and Re were periodically removed from the solution. The processing parameters determined in the pilot plant experiments were tested at semicommercial scale. While tests in a tube reactor were unsuccessful, investigations in a four compartment stirrable autoclave were successful. With reaction temperatures of about 225 C and a three to five bar O2 partial pressure, the oxidation was complete after about 8 hours. The molybdenum oxide technical grade, after drying and calcining, contains a maximum of 0.10% S. It can be processed to ferromolybdenum without difficulties. By recycling of the sulfuric acid, solution produced, it is possible to recover (in form of MoO3 technical grade) more than 98% of the molybdenum charged in MoS2. The recovery rate is considerably higher than that in the MoS2 roasting process and can, in relation to the concentrates' contents, reach more than 90%. Even high Cu containing concentrates can be processed without problems; Cu sulfate is removed from the recycled solution by cooling crystallization. The sulfur in the MoS2 concentrate is oxidized to sulfate and removed from the circulating solution in form of gypsum. Author

N84-25197# Research Inst. of National Defence, Stockholm (Sweden).
REPORT ON A SERIES OF MEASURES AND TESTS, IN STOCKHOLM AND IN LJUNGDYHEAD Final Report [MAETNING AV SMAA MAENGDER XENON-133 I LUFT]
Brita Bernstroem (Statens Straalskyddsinstitut) and Lars-Erik DeGeer Nov. 1983 40 p refs In SWEDISH; ENGLISH summary
(FOA-C-20515-A1; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

A method for collection and analysis of xenon-133 in ambient air is discussed. Xenon is collected from air on cooled activated charcoal and the gamma radiation is counted on a germanium detector. The disturbing effects of radon-222, which partly follows xenon in the collection process,are reduced through chromatographic separation of the two gases. The detection limit for xenon-133 is therefore lowered by a factor of three to 0.6 mBq xenon-133/kg of air. This technique will aid in radioactive pollution monitoring. R.S.F.

N84-25198# Institute of Oceanographic Sciences, Wormley (England).
STRUCTURAL STUDIES OF THE NORTHWEST IBERIAN CONTINENTAL MARGIN USING LONG-RANGE SIDE-SCAN SONAR
R. G. Rothwell 1983 51 p refs Sponsored by the UK Department of Energy
(IOS-161) Avail: NTIS HC A04/MF A01

The structural framework of the Northwestern Iberian Margin in seismic reflection profiles and GLORIA-II sidescan data and the present knowledge of its structural evolution are discussed. The Atlantic margin of Iberia differs from typical Atlantic-type passive margins in that its present day morphology was controlled by two major tectonic events: mesozoic rifting, related to the

opening of the Atlantic, and an eocene compressive phase, related to the Pyrenean orogeny. The geophysical data allow the construction of an accurate basement outcrop map of the margin and provide additional information on the tectonic lineaments. The data form a basis for improved regional structure maps. E.A.K.

N84-25199# Stockholm Univ. (Sweden). Dept. of Meterology.
SULFATE IN PRECIPITATION. A PRESENTATION OF DATA FROM THE EUROPEAN AIR CHEMISTRY NETWORK
Henning Rodhe, Lennart Granat, and Rolf Soederlund 9 Jan. 1984 76 p refs Sponsored by Swedish National Environment Protection Board.
(CM-64; ISSN-0280-445X) Avail: NTIS HC A05/MF A01

Data are presented on concentration of sulfate in precipitation obtained at more than 150 stations in northern Europe during the period 1955 to 1979. Sampling was carried out on a monthly basis using bulk precipitation collectors. The quality of the data is discussed and brief remarks are made concerning areal variability, seasonal cycles and long-term changes. R.J.F.

N84-25200# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.
ACIDIFICATION OF RAIN BY THE OXIDATION OF DISSOLVED SO2 AND THE ABSORPTION OF HNO3
J. L. Durham, H. M. Barnes, and J. H. Overton, Jr. (Northrop Services, Inc., Research Triangle Park, N. C.) 1984 74 p refs (PB84-168368; EPA-600/D-84-081) Avail: NTIS HC A04/MF A01 CSCL 07D

Calculations are presented for subcloud acidification of rain. The roles of chemical oxidation kinetics, mass transport rates for gas scavenging, and the raindrop size distribution were examined. Hydrogen peroxide (H2O2) of a concentration of 10 ppb greatly dominates O3 and Mn(+2) in oxidizing dissolved SO2 to form H(-1) and SO4(-2). Nitric acid (HNO3) is important for acidification of rain and it also slightly inhibits SO4(-2) formation. Subcloud scavenging of H2O2 and HNO3 is mass transport limited, thus causing the acidification of rain to be mass transported limited. The Marshall-Palmer distribution results in greater predictions of acidity in the form of SO4(-2), and NO3(-1) than the best distribution for raindrops larger than 0.2 mm. Subcloud acidification of rain is strongly dependent on: (1) the concentrations of SO2, H2O2, and HNO3; (2) the subcloud fall distance; and (3) the raindrop size distribution. DOE

N84-25201# Industrial Environmental Research Lab., Research Triangle Park, N. C.
X-RAY DIFFRACTION PHASE ANALYSIS OF PROCESS AND POLLUTION CONTROL DEVICE SAMPLES
F. E. Briden 1984 9 p refs
(PB84-168632; EPA-600/D-84-083) Avail: NTIS HC A02/MF A01 CSCL 07D

The efficacy of X-ray diffraction (XRD) as an analytic technique for characterizing waste incinerator by-products is discussed. X-ray fluorescence (XRF) spectrometry was used for the elemental analysis because it provides very complete information with minimal sample preparation and analysis time. Two samples were analyzed which illustrate the difference between the final products obtained from the incineration of a waste crankcase oil sample by pot vaporization and air atomization. Also analyzed were particulate samples from two commercial waste incinerators, as well as three samples from lead and copper smelters. Study results indicate that XRD, applied with XRF, can be an effective tool for the characterization of industrial process streams. Information gained from this technique can be used for process and pollution control equipment evaluation and for by-product disposal criteria.
Author (GRA)

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-25202# Ionospheric Prediction Service, Darlinghurst (Australia). Operational Programs Div.
HANDBOOK - H8: DESCRIPTION OF SERVICES
Apr. 1984 63 p
Avail: NTIS HC A04/MF A01

This is the eighth in the series of Handbooks issued by the Australian Ionospheric Prediction Service (IPS). Three main services are provided and include: (1) radio communications predictions; (2) disturbance warnings; (3) frequency data. The level of solar activity (sunspot cycle) is now declining and as a result, the usable range of the high frequency radio spectrum will be reduced over the next few years. There will be a reduction in the occurrence of sudden commencement disturbances and daylight fadeouts and an increase in the recurrent type of disturbances. M.A.C.

N84-25203*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AURORAL KILOMETRIC RADIATION: WAVE MODES, HARMONIC AND SOURCE REGION ELECTRON DENSITY STRUCTURES
Robert F. Benson May 1984 76 p refs Submitted for publication
(NASA-TM-86101; NAS 1.15:86101) Avail: NTIS HC A05/MF A01 CSCL 04A

A change from extraordinary (X) mode to ordinary (0) mode dominance is observed in the auroral kilometric radiation (AKR) detected on ISIS 1 topside sounder ionograms as the source region plasma to gyrofrequency ratio fN/fH varies from 0.1 to 1.3. The X and 0 mode AKR, Z (the slow branch of the X mode) and whistler (W) mode are also observed. The Z mode is typically slightly less intense than the 0-mode. Thw W-mode is confined to frequencies less than fH/2, suggesting that it is the result of field aligned ducted signals reaching the satellite from a source at lower altitudes. Harmonic AKR bands are commonly observed and the 2nd harmonic appears to be due to propagating signals. The deduced (fN/fH) at the bottom of the AKR source region is always less than 0.4 and is typically less than 0.2 during the generation of X-mode AKR, but approaches 0.9 for 0-mode AKR. No large density enhancements were observed within AKR source region density cavities. It is suggested that the observed INTENSE AKR IS cyclotron X-mode radiation rather than plasma frequency 0-mode radiation. E.A.K.

N84-25204*# National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF CHEMICAL RELEASES BY THE STS-3 ORBITER ON THE IONOSPHERE Final Report
Jolene S. Pickett (Iowa Univ., Iowa City), Gerald B. Murphy (Iowa Univ., Iowa City), William S. Kurth (Iowa Univ., Iowa City), and Stanley D. Shawhan Dec. 1983 43 p refs Submitted for publication
(Contract NAS8-32807; Grant NAG3-449)
(NASA-CR-171032; NAS 1.26:171032; U-OF-IOWA-84-5) Avail: NTIS HC A03/MF A01 CSCL 04A

The Plasma Diagnostics Package, flown aboard STS-3 as part of the first Shuttle payload (OSS-1), recorded the effects of various chemical releases from the Orbiter. Changes in the plasma environment was observed during flash evaporator system releases, water dumps and maneuvering thruster operations. During flash evaporator operations, broadband Orbiter-generated electrostatic noise was enhanced and plasma density irregularities were observed to increase by 3 to 30 times with a spectrum which rose steeply and peaked below 6 Hz. In the case of water dumps, background electrostatic noise was enhanced at frequencies below about 3 kHz and suppressed at frequencies above 2 kHz. Thruster activity also stimulated electrostatic noise with a spectrum which

peaked at approximately 0.5 kHz. In addition, ions with energies up to 1 keV were seen during some thruster events. Author

N84-25205*# Alabama Univ., Huntsville. School of Mathematical and Natural Sciences.
PLASMA AND MAGNETOSPHERIC RESEARCH Quarterly Progress Report, Dec. 1983 - Feb. 1984
Richard H. Comfort and James L. Horwitz Mar. 1984 12 p refs (Contract NAS8-33982)
(NASA-CR-171031; NAS 1.26:171031) Avail: NTIS HC A02/MF A01 CSCL 04A

Methods employed in the analysis of plasmas and the magnetosphere are examined. Computer programs which generate distribution functions are used in the analysis of charging phenomena and non maxwell plasmas in terms of density and average energy. An analytical model for spin curve analysis is presented. A program for the analysis of the differential ion flux probe on the space shuttle mission is complete. Satellite data analysis for ion heating, plasma flows in the polar cap, polar wind flow, and density and temperature profiles for several plasmasphere transits are included. M.A.C.

N84-25206# Royal Netherlands Meteorological Inst., De Bilt. Fysisch Meteorologisch Ondrzoek.
INTERNAL GRAVITATION WAVES IN A STABLY STRATIFIED ATMOSPHERE [INTERNE GRAVITATIEGOLVEN IN EEN STABIEL GELAAGDE ATMOSFEER]
Anne F. deBaas 1984 103 p refs In DUTCH; ENGLISH summary
(KBMI-WR-84-1) Avail: NTIS HC A06/MF A01

In a stably stratified boundary layer, the variances of wind and temperature mesurements are caused partly by waves and partly by turbulence. These two mechanisms have very different properties with respect to the transport of air pollutants; waves do not transport contaminants, whereas turbulence is an effective mixing mechanism. The variances in wind and temperature profiles due to waves and turbulence in a stably stratified atmospheric boundary layer (where waves and turbulence are present concurrently) were investigated. The effects of waves and turbulence were distinguished by solving the Taylor-Goldstein equation for measured wind and temperature profiles. Kelvin-Helmholtz instabilities were found through numerical methods and in the calculated fluctuation spectra. Such instabilities explain the calculated variance profiles. R.S.F.

N84-25207# Royal Netherlands Meteorological Inst., De Bilt. Wetenschappelijk Onderzoek.
THE SPECIFIC HUMIDITY PROFILE OF THE CONVECTIVE ATMOSPHERIC BOUNDARY LAYER [HET VOCHTPROFIEL IN DE CONVECTIEVE GRENSLAG]
M. Lindeman (Landbouwhogeschool, Wageningen, Netherlands), A. G. Driedonks, and J. Reiff 1984 62 p refs In DUTCH; ENGLISH summary
(KNMI-WR-84-2) Avail: NTIS HC A04/MF A01

The specific humidity profile of the convective atmospheric boundary layer (ABL) was investigated. A slab model of the convective ABL is presented in which the specific humidity in the ABL is allowed to be not well mixed. Experimental data generated from radiosondes and surface flux measurements are presented and interpreted. From these data specific humidity fluxes were calculated. Humidity profiles projected by atmospheric models are compared with those derived from experimental measurement. R.S.F.

N84-25208# Research Inst. of National Defence, Stockholm (Sweden).
TUBE WAVES RECORDED IN A SEISMIC CROSSHOLE EXPERIMENT
Matts Gustavsson Nov. 1983 16 p refs Sponsored by Swedish Council for Radioactive Waste and Swedish Nuclear Fuel Supply Co.
(FOA-C-20521-E1; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

Tube waves, recorded by an array of three borehole geophones in a seismic crosshole experiment are described. It is found that the sources to the tube waves can easily correlated to fractures and fracture zones along the borehole wall. E.A.K.

N84-25209# Technion - Israel Inst. of Tech., Haifa. Dept. of Physics.
MEASUREMENT OF ATMOSPHERIC TRANSMISSION OVER LONG PATHS IN THE INFRARED SPECTRAL REGION Interim Scientific Report, 1 Oct. 1982 - 31 Dec. 1983
U. P. Oppenheim and S. G. Lipson 29 Feb. 1984 9 p
(Grant AF-AFOSR-0023-83; AF Proj. 2301)
(AD-A139619; EOARD-TR-84-12) Avail: NTIS HC A02/MF A01 CSCL 04/1

Instrumentation built for long path spectroradiometric measurement is described. Preliminary results for atmospheric transmission over a 7 km path are reported. A comparison is made with LOWTRAN computations. Author (GRA)

N84-25210# Lowell Univ., Mass. Center for Atmospheric Research.
IONOSPHERIC RESEARCH USING DIGITAL IONOSONDES Final Report, Mar. 1980 - Apr. 1983
B. W. Reinisch and K. Bibl Jul. 1983 232 p
(Contract F19628-80-C-0064; AF Proj. 4643)
(AD-A140012; ULRF-425/CAR; AFGL-TR-83-0184) Avail: NTIS HC A11/MF A01 CSCL 04/1

New digital UF sounding techniques are used for the study of the high altitude and the equatorial ionosphere: Doppler and incidence angle measurements allow one to identify irregularities in the ionospheric plasma and to determine their velocities. In the drift mode of observation the Digisonde with a four antenna receiving array measured the plasma bulk motion at Goose Bay. The results show that the HF Doppler technique measures the plasma convection also observed by incoherent scatter and satellite techniques. Automatic scaling of Digisonde ionograms is now routinely carried out at the Goose Bay Ionospheric Observatory. The E and F region echo traces are reliably determined also under spread conditions. The Automatic Real Time Ionogram Scaler with True Height also finds all standard ionospheric parameters and the electron density profile in real time. Author (GRA)

N84-25211# Portland State Univ., Oreg. Dept. of Earth Sciences.
GEOCHEMICAL ANALYSES, AGE DATES, AND FLOW-VOLUME ESTIMATES FOR QUATERNARY VOLCANIC ROCKS, SOUTHERN CASCADE MOUNTAINS, WASHINGTON
Paul E. Hammond and Michael A. Korosec (Washington Div. of Geology and Earth Resources.) Dec. 1983 59 p refs
(Contract DE-AC07-79ET-27014)
(DE84-007662; DOE/ET-27014/T7) Avail: NTIS HC A04/MF A01

Data collected over the last three years as part of a continuing study of the Quaternary volcanic rocks of the southern Cascade Mountains are presented. Whole-rock chemical analyses, selected trace element geochemistry, volume approximations, specific gravity determinations, and locations are provided for most of the 103 samples collected, and 21 radiometric age dates are included. In addition, partial information, including names and flow-volumes, are presented for 98 additional samples, collected for related studies. The study extends from the Columbia River north to the Cowlitz River and Goat Rocks Wilderness area, and from the Klickitat River west to the Puget-Williamette Trough. The volcanic rocks are all younger than 3 million years and consist primarily of tholeiitic and high-alumina basalts and basaltic-andesites erupted from numerous shield volcanoes and cinder cones. A few analyses of more silicic rocks, including hornblende and/or pyroxene andesites and dacites characteristic of the stratovolcanoes of the region, are also presented. DOE

N84-25212# Department of Energy, Las Vegas, Nev. Environmental Branch.
LONG-TERM HYDROLOGIC MONITORING PROGRAM. RUL-

ISON EVENT SITE, GRAND VALLEY, COLORADO
Jan. 1984 29 p refs
(DE84-008210; NVO-273) Avail: NTIS HC A03/MF A01

The Hydrologic Program Advisory Group reviewed the Long-Term Hydrologic Monitoring Program proposed for the Rulison site at their December 12, 1971, meeting. Samples are collected annually, at about the same dates each year. The hydraulic head, temperature in (0)C, pH, and electrical conductance are recorded at the time or sample collection. Prior to October 1, 1979, each sample was analyzed for gamma emitters and tritium. Gross alpha and beta radioactivity measurements were made on all samples collected. After October 1, 1979, these analyses were discontinued in favor of high-resolution gamma spectrometry using GeLi detector. For each sample location, samples of raw water and filtered and acidified water are collected. The raw water samples are analyzed for tritium by the conventional method. Those samples with concentrations that are below the detection level for this method are then analyzed by the enrichment method. Portions of the filtered and acidified samples are analyzed for gamma emitters. DOE

N84-25213# Geological Survey, Denver, Colo.
SOUTHERN GREAT BASIN SEISMOLOGICAL DATA REPORT FOR 1981 AND PRELIMINARY DATA ANALYSIS
A. M. Rogers, S. C. Harmsen, W. J. Carr, and W. Spence Sep. 1983 263 p refs
(Contract DE-AI08-78ET-44802)
(DE84-005687; USGS-OFR-83-669) Avail: NTIS HC A12/MF A01

Earthquake data for the calendar year 1981 are reported for earthquakes occurring within and adjacent to the southern Great Basin seismograph network. Locations, magnitudes, and selected focal mechanisms for these events and events from prior years of network operations are presented and discussed in relation to the geologic framework of the region. These data are being collected to aid in the evaluation of the seismic hazard to a potential repository site at Yucca Mountain in the southwestern Nevada Test Site. The regional stress field orientation, as inferred from focal mechanisms, is characterized by a northwest-directed least compressive stress and a northeast-directed greatest compressive stress. We infer from this stress orientation that faults of north to northeast trend are most susceptible to slip. Faults of this orientation exist within the Yucca Mountain block, but they probably have not moved significantly in the last 500,000 years. At present, somewhat conflicting geologic, seismologic, and stress evidence hinder definitive conclusions about the seismic hazard at the proposed repository site. DOE

N84-25214# State Univ. of New York, Stony Brook.
GEOCHEMISTRY AND ORIGIN OF REGIONAL DOLOMITES
Gilbert N. Hanson 1984 27 p
(Contract DE-AC02-83ER-13112)
(DE84-008257; DOE/ER-13112/1) Avail: NTIS HC A03/MF A01

Quantitative, geochemical models for the source, flow paths and chemistry of the diagnetic fluids responsible for the widespread dolomitization of the Mississippi Burlington-Keokuk Fms were developed. Iowa, Illinois and Missouri by integrating geochemistry, fluid inclusion studies, conventional and luminescent petrography, stratigraphy, facies analysis and burial history. The study includes western Illinois and eastern Missouri and southeastern Iowa. This includes most of the area where good sections of facies from near shore to the platform edge. The geochemical studies include: correlation of the major and trace element variations within the various Burlington dolomites developed in southeastern Iowa and adjacent areas of Illinois and Missouri; rare earth element, Nd and Sr isotope analysis of the dolomites and coexisting phases; major and trace element analysis, petrography and X ray mineralogy of selected shaly members in the Burlington-Keokuk formations; and fluid inclusion studies of the calcites and dolomite cements of southeastern Iowa. DOE

N84-25215# Institute for Telecommunication Sciences, Boulder, Colo.
GLOBAL MAPS OF foF2 DERIVED FROM OBSERVATIONS AND THEORETICAL VALUES
C. M. Rush, M. PoKempner, D. N. Anderson, J. Perry, and F. G. Stewart Jan. 1984 144 p refs
(PB84-163906; NTIA-Rept-84-140) Avail: NTIS HC A07/MF A01 CSCL 04A

Observations of the F2-region critical frequency, foF2, and values determined from the time-dependent continuity equation for ions and electrons in the ionosphere were used to develop a new set of numerical coefficients to represent the global variation of foF2. The coefficients developed in this study, like those in earlier investigations, permit monthly median hourly values of foF2 to be obtained at any location around the globe for any month of the year and solar activity level. The procedures undertaken to develop the new numerical coefficients are described. Comparisons between foF2 determined using older sets of numerical coefficients and foF2 determined using the new set of coefficients specifies and predicts the observed variations in the F2-region critical frequency. GRA

N84-25216# Geological Survey, Denver, Colo.
PRINCIPAL FACTS, BASE STATION DESCRIPTIONS AND PLOTS FOR GRAVITY STATIONS ON AND NEAR THE BUTTE 1 DEGREE X 2 DEGREE QUADRANGLE, MONTANA
J. H. Hassemer Jan. 1984 81 p refs
(PB84-168103; USGS/GD-84-001) Avail: NTIS HC A05/MF A01 CSCL 08E

Principal facts (location, values, corrections and anomalies) for 2299 gravity stations on and near the Butte 1 degree x 2 degree quadrangle, Montana are given. The data are listed in five separate tables depending on the source of the information. Plots showing the station location with identification and descriptions of ten base stations are included. The report includes a discussion of how the data were collected, processed, and relation to similar data on the quadrangles to the north and south. The data for most of the gravity stations contain a code for the elevation determination that indicates the accuracy of the elevation. All of the gravity data values have been reduced to complete Bouguer anomalies with terrain and curvature connections made to 166.7 kilometer. GRA

N84-25129*# Purdue Univ., Lafayette, Ind.
EURO-AFRICAN MAGSAT ANOMALY-TECTONIC OBSERVATIONS Abstract Only
W. J. Hinze, R. R. B. vonFrese, Principal Investigators (Ohio State Univ., Columbus), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 25-26 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25130*# Pittsburgh Univ., Pa.
CORRELATION OF TECTONIC PROVINCES OF SOUTH AMERICA AND THE CARIBBEAN REGION WITH MAGSAT ANOMALIES Abstract Only
E. G. Lidiak, W. J. Hinze (Purdue Univ., Lafayette, Ind.), G. R. Keller, Principal Investigators (Texas Univ., El Paso), D. W. Yuan, and M. B. Longacre (Purdue Univ., Lafayette, Ind.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 27-28 Presented at the 10th Caribbean Geol. Conf., Cartagena, Colombia, Aug. 1983 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25131*# SOHIO Petroleum Co., Cleveland, Ohio.
SATELLITE ELEVATION MAGNETIC AND GRAVITY MODELS OF MAJOR SOUTH AMERICAN PLATE TECTONIC FEATURES Abstract Only
R. R. B. vonFrese, W. J. Hinze (Purdue Univ., Lafayette, Ind.), L. W. Braile (Purdue Univ., Lafayette, Ind.), E. G. Lidiak (Pittsburgh Univ.), G. R. Keller, Principal Investigators (Texas Univ., El Paso), and M. B. Longacre (Sohio Petroleum Co.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 33 Presented at the 4th IAGA Sci. Assembly, Edinburgh, 3-15 Aug. 1981 ERTS (For primary document see

N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25132*# Purdue Univ., Lafayette, Ind.
REDUCED TO POLE LONG-WAVELENGTH MAGNETIC ANOMALIES OF AFRICA AND EUROPE Abstract Only
W. J. Hinze, R. R. B. vonFrese, Principal Investigators (Ohio State Univ., Columbus), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 34 Presented at the Am. Geophys. Union Ann. Meeting, Baltimore, 1983 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25133*# Purdue Univ., Lafayette, Ind.
SATELLITE MAGNETIC ANOMALIES OF AFRICA AND EUROPE Final Report
W. J. Hinze, R. R. B. vonFrese, Principal Investigators (Ohio State Univ., Columbus), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 35-44 refs Presented at the 52nd Ann. Intern. Meeting and Exposition of the Soc. of Exploration Geophysicists, Dallas, 1982 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08N

N84-25134*# Ohio State Univ., Columbus.
DO SATELLITE MAGNETIC ANOMALY DATA ACCURATELY PORTRAY THE CRUSTAL COMPONENT? Abstract Only
R. R. B. vonFrese and W. J. Hinze, Principal Investigators (Purdue Univ., Lafayette, Ind.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 45 Presented at the Geomagnetic Conf., Denver, 1982 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25135*# Ohio State Univ., Columbus.
LONG-WAVELENGTH MAGNETIC AND GRAVITY ANOMALY CORRELATIONS OF AFRICA AND EUROPE Abstract Only
R. R. B. vonFrese, W. J. Hinze, Principal Investigators (Purdue Univ., Lafayette, Ind.), and R. Olivier (Lausanne Univ.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 46 Presented at the 17th IUGG Gen. Assembly, Hamburg, 1983 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25136*# Ohio State Univ., Columbus.
US AEROMAGNETIC AND SATELLITE MAGNETIC ANOMALY COMPARISONS Abstract Only
R. R. B. vonFrese, W. J. Hinze (Purdue Univ., Lafayette, Ind.), L. W. Braile, Principal Investigators (Purdue Univ., Lafayette, Ind.), and J. L. Sexton (ARCO) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 50-51 Presented at the 4th IAGA Sci. Assembly, Edinburgh, 3-15 Aug. 1981 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25137*# Pittsburgh Univ., Pa. Dept. of Geology and Planetary Science.
RELATION OF MAGSAT ANOMALIES TO THE MAIN TECTONIC PROVINCES OF SOUTH AMERICA Final Report
E. G. Lidiak, G. R. Keller, Principal Investigators (Texas Univ., El Paso), D. W. Yuan, and M. B. Longacre (Purdue Univ., Lafayette, Ind.) *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 p 52-58 Presented at the 52nd Ann. Intern. Meeting and Exposition of the Soc. of Exploration Geophysicists, Dallas, 1982 ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25138*# Pittsburgh Univ., Pa.
RELATION OF MAGSAT AND GRAVITY ANOMALIES TO THE MAIN TECTONIC PROVINCES OF SOUTH AMERICA M.S. Thesis
Ding-Wen Yuan *In* Texas Univ. Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 177 p refs ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

N84-25139*# Texas Univ., El Paso.
A CRUSTAL STRUCTURE STUDY OF SOUTH AMERICA M.S. Thesis
Kevin Scott Renbarger *In its* Appl. of MAGSAT to Lithospheric Modeling in South America, Part 2 Jan. 1984 261 p refs ERTS (For primary document see N84-25128 15-43)
Avail: NTIS HC A21/MF A01 CSCL 08G

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-25217*# Tennessee Univ. Space Inst., Tullahoma. Div. of Atmospheric Science.
NUMERIC AND FLUID DYNAMIC REPRESENTATION OF TORNADIC DOUBLE VORTEX THUNDERSTORMS Final Report
J. R. Connell, Edward J. Marquart, Walter Frost, and Wilson Boaz May 1980 67 p refs
(Contract NAS8-31718)
(NASA-CR-171023; NAS 1.26:171023) Avail: NTIS HC A04/MF A01 CSCL 04B

Current understanding of a double vortex thunderstorm involves a pair of contra-rotating vortices that exists in the dynamic updraft. The pair is believed to be a result of a blocking effect which occurs when a cylindrical thermal updraft of a thunderstorm protrudes into the upper level air and there is a large amount of vertical wind shear between the low level and upper level air layers. A numerical tornado prediction scheme based on the double vortex thunderstorm was developed. The Energy-Shear Index (ESI) is part of the scheme and is calculated from radiosonde measurements. The ESI incorporates parameters representative of thermal instability and blocking effect, and indicates appropriate environments for which the development of double vortex thunderstorms is likely. Author

N84-25218# Japan Broadcasting Corp., Tokyo. Radio Engineering Research Div.
MEASUREMENTS OF RAIN ATTENUATION AT 12 GHz WITH THE BSE
Kiyoshi Murakami and Shiro Ito Nov. 1983 12 p refs
(NHK-LN-292; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

The 12 GHz frequency band, allocated to satellite broadcasting, was used for the down-link of the BSE. At frequencies greater than 10 GHz, attenuation caused by rain on the propagation path can impair a broadcast signal. In order to obtain information to establish design criteria for a satellite broadcasting system, NHK was investigating since 1966 the statistical characteristics of rain attenuation in the 12 GHz band by the use of a radiometer at its Laboratories in Tokyo. The Japanese Medium-scale Broadcasting Satellite for Experimental Purpose (BSE) was launched on the 8th of April 1978, and placed into a geostationary orbit at a longitude of 110 degrees East. Author

N84-25219*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
A ROBUST PSEUDO-INVERSE SPECTRAL FILTER APPLIED TO THE EARTH RADIATION BUDGET EXPERIMENT (ERBE) SCANNING CHANNELS
Lee M. Avis, Richard N. Green, John T. Suttles, and Shashi K. Gupta (Kentron International, Inc.) Mar. 1984 33 p refs
(NASA-TM-85781; NAS 1.15:85781) Avail: NTIS HC A03/MF A01 CSCL 04B

Computer simulations of a least squares estimator operating on the ERBE scanning channels are discussed. The estimator is designed to minimize the errors produced by nonideal spectral

response to spectrally varying and uncertain radiant input. The three ERBE scanning channels cover a shortwave band a longwave band and a "total" band from which the pseudo inverse spectral filter estimates the radiance components in the shortwave band and a longwave band. The radiance estimator draws on instantaneous field of view (IFOV) scene type information supplied by another algorithm of the ERBE software, and on a priori probabilistic models of the responses of the scanning channels to the IFOV scene types for given Sun scene spacecraft geometry. It is found that the pseudoinverse spectral filter is stable, tolerant of errors in scene identification and in channel response modeling, and, in the absence of such errors, yields minimum variance and essentially unbiased radiance estimates. E.A.K.

N84-25220*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INVESTIGATION OF THERMOSPHERIC WINDS RELATIVE TO SPACE STATION ORBITAL ALTITUDES
Michael Susko Mar. 1984 19 p refs
(NASA-TM-82577; NAS 1.15:82577) Avail: NTIS HC A02/MF A01 CSCL 04B

An investigation of thermospheric winds, relative to the space station orbital altitudes, was made in order to provide information that is useful in an environmental disturbance assessment. Current plans are for this low Earth orbiting facility to orbit at an inclination of 28.5 deg. The orbital altitudes were not yet defined due to the evolutionary configuration of the Space Station. The upper and lower bounds of the orbital altitudes will be based on constraints set by the drag and expected orbital decay and delivery altitude capability of the Shuttle. The orbital altitude will be estimated on the order of 500 km. Neutral winds in the region from about 80 to 600 km which were derived from satellite drag data, Fabry-Perot interferometers, sounding rockets, ground-based optical Doppler techniques, incoherent scatter radar measurements from Millstone Hill combined with the mass spectrometer and lithium trail neutral wind measurements are examined. The equations of motion of the low Earth orbiting facility are also discussed. Author

N84-25221*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODELING GLACIAL CLIMATES
Gerald R. North and Thomas J. Crowley May 1984 35 p refs
(NASA-TM-86106; NAS 1.15:86106) Avail: NTIS HC A03/MF A01 CSCL 04B

Mathematical climate modelling has matured as a discipline to the point that it is useful in paleoclimatology. As an example a new two dimensional energy balance model is described and applied to several problems of current interest. The model includes the seasonal cycle and the detailed land-sea geographical distribution. By examining the changes in the seasonal cycle when external perturbations are forced upon the climate system it is possible to construct hypotheses about the origin of midlatitude ice sheets and polar ice caps. In particular the model predicts a rather sudden potential for glaciation over large areas when the Earth's orbital elements are only slightly altered. Similarly, the drift of continents or the change of atmospheric carbon dioxide over geological time induces radical changes in continental ice cover. With the advance of computer technology and improved understanding of the individual components of the climate system, these ideas will be tested in far more realistic models in the near future. Author

N84-25222*# Computer Sciences Corp., Huntsville, Ala. Applied Technology Div.
VECTOR WIND GUST MODEL Final Report, 14 Feb. 1979 - 13 Apr. 1984
Stanley I. Adelfang 13 Apr. 1984 64 p refs
(Contract NAS8-34333)
(NASA-CR-171029; NAS 1.26:171029) Avail: NTIS HC A04/MF A01 CSCL 04B

The development of a vector wind gust model through statistical analysis is described. Wind perturbation statistics which include location, altitude, season, and wavelength range are used in the synthesis of detailed wing profiles. These profiles provide the basis for the establishment of improved discrete gust design criteria guidelines for ascending launch vehicles. M.A.C.

N84-25223*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FACILITIES FOR METEOROLOGICAL RESEARCH AT NASA GODDARD/WALLOPS FLIGHT FACILITY Final Report
John C. Gerlach and Robert E. Carr Jun. 1984 6 p refs
(NASA-TM-84422; NAS 1.15:84422) Avail: NTIS HC A02/MF A01 CSCL 04B

The technical characteristics of the Atmospheric Sciences Research Facility, the improvements being made to the instrumentation there which will enhance its usefulness in atmospheric research, and several of the on-going research programs are described. Among the area of atmospheric research discussed are clouds and precipitation, lightning, ozone, wind, and storms. Meteorological instruments including Doppler radar, spectrophotometers, and ozone sensors are mentioned. Atmospheric research relevant to aircraft design and COMSTAR communication satellites is briefly discussed. R.S.F.

N84-25224# European Space Agency, Paris (France).
SECOND-GENERATION METEOSAT: SYSTEM STUDY, EXECUTIVE SUMMARY
K. H. Stewart and B. Battrick, ed. Jan. 1984 26 p
(ESA-SP-1063; ISSN-0379-6566) Avail: NTIS HC A03/MF A01; ESA, Paris FF 60 Member States, AU, CN and NO (+20% others)

Meteorological satellite systems which meet the needs of the European meteorologist at the end of the current meteosat program were studied. Also considered were cost effective design concepts, preliminary cost and planning estimates, and critical needs for future development. B.G.

N84-25225# World Meteorological Organization, Geneva (Switzerland).
GUIDE TO CLIMATOLOGICAL PRACTICES, SECOND EDITION
1983 187 p refs
(WMO-100; ISBN-82-63-12100-1) Avail: NTIS MF A01; print copy available at WMO, Geneva

Information is given on the processing and interpretation of climatological data. The organization and functions of a climate service, the presentation and delivery of climate data and information, and topics in upper air, meso and microclimatology are discussed. R.J.F.

N84-25226# World Meteorological Organization, Geneva (Switzerland).
WORLD WEATHER WATCH PLANNING REPORT NO. 38: VERY SHORT RANGE FORECASTING: OBSERVATIONS, METHODS AND SYSTEMS
S. Bodin 1983 81 p refs
(WMO-621) Avail: NTIS MF A01; Print copy available at WMO, Geneva

Various aspects of very short range forecasting (VSRF), defined as local, detailed weather forecasts 0 to 12 hours ahead; are examined. Particular emphasis is given to newly developed VSRF systems in several different countries. Forecasting observations, data processing, and information dissemination are discussed. Meteorological satellites and radar, ground based remote sensing, and automatic weather stations are among the data processing systems and equipment reviewed. Specific problems of VSRF are addressed and a projection of its potential impact on the organization and structure of weather services, international information exchange, and international cooperation is advanced. R.S.F.

N84-25227# Calspan Advanced Technology Center, Buffalo, N.Y.
AEROSOL CHARACTERISTICS ON THE ALBORAN SEA, 9-18 OCTOBER 1982 Final Contractor Report, 17 Sep. 1982 - 7 Sep. 1983
E. J. Mack, C. W. Rogers, and J. N. Kile Dec. 1983 151 p
(Contract N00228-82-C-8170; DA Proj. F59-553)

(AD-A139892; CALSPAN-7076-M-1; NEPRF-CR-83-09) Avail: NTIS HC A08/MF A01 CSCL 04/2

An at-sea study of aerosol characteristics was conducted on the Alboran Sea to obtain data for potential correlation with sun photometry, overflight imagery and radiance data and for study of possible atmospheric/aerosol effects produced by sea surface temperature gradients of the Alboran Gyre. Observations of Aitken nuclei concentrations, aerosol size spectra (0.3 to 30 micrometers diameter), visibility (scattering coefficient), optical depth (sun photometry), air temperature, relative humidity, winds and cloud cover were acquired hourly during daylight hours of the cruise; samples for aerosol chemical analyses were obtained at approximate 3-hr intervals. The data show that aerosol populations, even in mid-Alboran, were typical of those observed previously at other near-coastal locals, although characterized by high proportions of NaCl aerosols. The cold water of the Alboran Gyre was apparently responsible for a stable atmospheric boundary layer, along the northern shore of the Alboran, which trapped aerosol plumes from the Gibraltar area at low levels. Finally, optical depth was found to correlate with surface level visibility integrated as a function of the relative humidity profile over the boundary layer, assuming a well-mixed boundary layer with respect to aerosols. GRA

N84-25228# Oklahoma Univ., Norman.
FOUR-DIMENSIONAL SATELLITE DATA ASSIMILATION Final Report
Y. K. Sasaki, G. L. Cross, and J. S. Goerss Jan. 1984 95 p
(Contract N00014-79-C-0758)
(AD-A139904) Avail: NTIS HC A05/MF A01 CSCL 04/2

In this report we describe the culmination of our global satellite data assimilation research efforts. A continuous temperature data assimilation scheme was designed to be implemented using the Navy Operational Global Atmospheric Prediction System (NOGAPS). In the next section, the details of this scheme are described. Two experiments were run using the operational satellite temperature data available to Fleet Numerical Oceanographic Center (FNOC). Each experiment consisted of an assimilation and a control run. The results of these experiments are detailed in Section 3. We conclude our report by summarizing our research and discussing its future applications to the improvement of NOGAPS forecasts. GRA

N84-25229# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: YOKOTA AIR BASE, JAPAN Final Report
Dec. 1983 320 p Supersedes USAFETAC/DS-79/111
(AD-A137579; USAFETAC/DS-83/049; USAFETAC/DS-79/111) Avail: NTIS HC A14/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Yokota Air Base, Japan. It contains the following parts: (1) weather condition, atmospheric phenomena; (2) precipitation, snowfall and snow depth (daily amounts and extreme values); (3) surface winds; (4) ceiling versus visibility sky cover; (5) psychrometric summaries (daily maximum and minimum) temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet bulb temperature depression versus dry bulb temperature, means and standard deviations of dry bulb, wet bulb and dew point temperatures and relative humidity; and (6) pressure summary (means, standard, deviations, and observation counts of station pressure and sea level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-25230# Oak Ridge National Lab., Tenn. Global Carbon Cycle Program.
JOINT HEARING ON CARBON DIOXIDE AND THE GREENHOUSE EFFECT. TESTIMONY PRESENTED TO SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT AND SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT OF THE SCIENCE AND TECHNOLOGY COMMITTEE, US HOUSE OF REPRESENTATIVES
John R. Trabalka 1984 66 p refs
(Contract W-7405-eng-26)
(DE84-007527; DOE/NBM-4007527) Avail: NTIS HC A04/MF A01

This testimony describes the DOE Carbon Cycle Research Program. Separate sections describe the technical objectives of the program, ongoing research activities, and future needs. DOE

N84-25231# National Weather Service, Silver Spring, Md. Communications Div.
INDEX NUMBERS FOR NORTH AND CENTRAL AMERICA, THE CARIBBEAN AND U.S. STATIONS IN THE PACIFIC: FIFTH EDITIONS
Jan. 1984 66 p
(PB84-159599; NWS/Communications/HB-4; NOAA-84022305) Avail: NTIS HC A04/MF A01 CSCL 05B

The World Meteorological Organization (WMO) uses a 5-digit number to identify stations used for synoptic purposes. This number is called the station index number. The WMO divided the world into 7 parts: 6 Regions plus the Antarctic. It assigns block numbers to individual countries. NWS Communications Handbook No.4 lists only the index numbers for stations in North America, Central America, the Caribbean, and some stations in the pacific. The stations are in numerical order by index number in the front of the book, and in alphabetical order by station name in back.
Author (GRA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-25232# Institute of Oceanographic Sciences, Wormley (England).
BENTHIC BOUNDARY LAYER: IOS OBSERVATIONAL PROGRAMME Interim Report, Jan. 1983
P. M. Saunders 1983 34 p refs
(Contract DoE-DGR481/176)
(IOS-163; DOE/RW/83.067) Avail: NTIS HC A03/MF A01

Measurements were made over a period of seven months of currents and mixing near the seabed. The location of the study was in the N. Atlantic approximately midway between the islands of the Azores and Madeira. Currents were measured near the seabed in a water depth exceeding 5000m with moored internally-recording instruments. Maps of near bottom flow were constructed and the dispersion of particles of water and therefore mixing of a tracer, such as radionuclide were inferred. It is deduced that in a cloud of tracer of diameter between 1 and 20 km, mixing causes the average concentration to halve approximately every fifteen days. Observations of the behavior of clusters of free-drifting floats support this value. For cloud diameters of about 100km the time to halve the concentration is longer, about 60 days. R.J.F.

N84-25233# Institute of Oceanographic Sciences, Wormley (England).
CTD DATA FROM THE N.E. ATLANTIC 31N TO 46N, JULY 1982 DISCOVERY CRUISE 130
P. M. Saunders 1983 94 p refs
(Contract DOE-PECD/7/9/023)
(IOS-165; DOE/RW/83.139) Avail: NTIS HC A05/MF A01

Lists and graphs of CTD data obtained aboard RRS Discovery during July 1982 are presented. A series of 14 stations were occupied between approximate 31 deg N 24 deg W and 46 deg N 14 deg W in support of sound ranging trials. A further 20 stations were occupied in the vicinity of Discovery Gap, a channel for deep flow between the Madeira and Iberian basins near 37 deg 30 N 15 deg 30 W. All CTD data were reconciled with reversing thermometer measurements, and salinity and oxygen samples. Root mean square differences for pressure, temperature, salinity

and oxygen were 7 dB, .012 deg C, .007 PSU and 0.3 ml/l in the depth interval 0 to 2,000 dB and 6 dB, .005 deg C, .003 PSU and .16 ml/l for depths 2,000 to 5,600 dB. E.A.K.

N84-25234# Scripps Institution of Oceanography, La Jolla, Calif. Jolla Ca.
MAGNETIC ANOMALIES OF THE OCEAN
P. D. Young and C. S. Cox Oct. 1983 99 p
(Contract N00014-82-K-0999)
(AD-A139602) Avail: NTIS HC A05/MF A01 CSCL 08/14

There are two categories of magnetic anomalies associated with the ocean. Primary anomalies are induced directly by interaction of ocean flow with the geomagnetic field, or induced by ionospheric fluctuations, or are the expression of the remnant magnetization of the ocean floor rocks. Secondary anomalies are created by interaction of electric current flow in the ocean, with irregularities of the electrical conductivity distribution within the ocean, or with irregularities of the boundaries of the ocean (seafloor ridges and troughs or ocean surface waves). Our focus in this report is on secondary anomalies, although some attention is paid to primary effects for completeness. GRA

N84-25235# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
ANALYSIS OF AIRBORNE ELECTROMAGNETIC SYSTEMS FOR MAPPING THICKNESS OF SEA ICE Final Report, May - Aug. 1983
A. Becker, H. Morrison, and K. Smits Nov. 1983 41 p
(AD-A139786; NORDA-TN-261) Avail: NTIS HC A03/MF A01 CSCL 08/12

This report is part of our research program addressing AEM ice thickness determination and will demonstrate that the Navy requirements for rapid airborne methods for mapping ice thickness, in real time, can be accomplished with AEM techniques. At present, there are not reliable airborne techniques for measuring directly sea ice thickness, although impulse radar has yielded promising results by implying sea ice thickness from ice roughness measurements. GRA

N84-25236# Naval Postgraduate School, Monterey, Calif.
ONE-DIMENSIONAL MODEL HINDCASTS OF COLD ANOMALIES IN THE NORTH PACIFIC OCEAN M.S. Thesis
G. L. Stringer Dec. 1983 137 p
(AD-A139870) Avail: NTIS HC A07/MF A01 CSCL 08/10

Two cases of pronounced, long-term cold anomalies from the North Pacific Ocean Experiment TRANSPAC monthly analyses during 1976-79 are studied. The first case developed after October 1977 and persisted to June 1978. Two periods of amplification of the anomaly are identified. The second anomaly was the most extreme cold anomaly in the four-year sample. The relationships between local atmospheric forcing, and the development, existence and decay of the anomalies are examined with the Garwood ocean mixed layer model. In the first case, the fall deepening period was hindcast very well. However, the period of sprint transition and seasonal warming were not well predicted. It is deduced that the most likely cause of the errors is inaccurate atmospheric forcing. In the second case, the model predictions are very sensitive to the surface heat flux. This anomaly cannot be satisfactorily simulated with the Garwood model. This appears to be due to large uncertainties in the surface heat flux fields in the summer. Author (GRA)

N84-25237# Florida State Univ., Tallahassee. Dept. of Oceanography.
[RESEARCH IN OCEANOGRAPHY] Annual Technical Report, 1 Apr. 1983 - 31 Mar. 1984
Y. Hsueh, D. Nof, J. J. OBrien, W. Sturges, and D. Thistle Jan. 1984 12 p
(Contract N00014-82-C-0404)
(AD-A139890) Avail: NTIS HC A02/MF A01 CSCL 08/3

Several ocean phenomena and parameters are reviewed. Topics discussed include: ocean currents, mesoscale phenomena, ocean weather forecasting, coastal sea level, and sediment erosion. Geographic areas investigated ranged from the Pacific Ocean and Indian Ocean to the coastal waters of the United States. Specific subjects discussed included ground wind and exopolymer binding of sediment by aquatic organisms. R.S.F.

N84-25238# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
MARGINAL ICE ZONE EXPERIMENT (1983). PART 1: ICE CHARACTERIZATION MEASUREMENTS. PART 2. HELICOPTER-BORNE AND SHIP-BASED RADAR BACKSCATTER MEASUREMENT OF SEA ICE IN THE MARGINAL ICE ZONE Technical Report
R. G. Onstott Jan. 1984 30 p
(Contract N00014-76-C-1105)
(AD-A139894; CRINC/RSL-TR-331-32) Avail: NTIS HC A03/MF A01 CSCL 08/12

A series of sensor-oriented characterization measurements in support of the experiment's remote sensing efforts from the Polarbjorn ice strengthened ship during the 1983 Marginal Ice Zone Experiment were conducted. Measurements describe the physical properties of the ice in this region and are reported herein. Descriptions include: ice and snow thickness; ice salinity profiles; air, ice and snow temperatures; the construction of the snow pack; and general comments about floe topography. GRA

N84-25239# Naval Postgraduate School, Monterey, Calif.
OBSERVATIONS OF INERTIO-GRAVITY WAVES IN THE WAKE OF HURRICANE FREDERIC M.S. Thesis
L. K. Shay Dec. 1983 121 p
(AD-A139944) Avail: NTIS HC A06/MF A01 CSCL 08/3

Inertial waves excited in the mixed layer by hurricane Frederic, had horizontal scales of approximately 1 to 2 times the haroclinic Rossby radius of deformation (50 km) of the first mode near the Desoto Canyon. Initially, energy propagated vertically at about 1.25 km/d and horizontally at 80 km/d. These waves spun down over e-folding scales of four inertial periods as energy propagated vertically at 270 m/d and horizontally at 30 km/d. Inertio-gravity waves in the deep thermocline had horizontal scales of 25 to 50 km and vertical scales approximately equal to the water depth. The energy of these waves was dominated by the barotropic mode with some contributions from modes 1 and 2. These waves were not admitted to the self region because the bottom slope was greater than the slope of the internal wave characteristics. The mean flow followed the isobaths at all levels, but it was in the opposite direction in the bottom layer. The mean flow initially decreased along the eastern boundary of the canyon as the storm forcing readjusted the flow. Near-bottom temperature variations of 4 C were associated with the storm surge and advection in the along-track direction, particularly along the north rim of the canyon. GRA

N84-25240# Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
CLASSIFICATION OF COASTAL ENVIRONMENTS, SHOREZONE PROFILE DYNAMICS
R. J. Wayland and B. P. Hayden Mar. 1984 76 p
(Contract N00014-81-K-0033)
(AD-A139947; TR-29) Avail: NTIS HC A05/MF A01 CSCL 08/3

Principal components analysis was used to quantify subaerial and subaqueous summer to winter nearshore morphological change on the North Carolina coast near Duck. The first two eigenvectors explained 61.1% of the total variance. El (35.4% of the variance) is a profile rotation and E2 (25.7% of the variance) is a bar/trough function. Two major periods of change were found. High pressure systems in October and extratropical cyclones in November were the weather systems implicated in these changes. These storms caused the profiles to become dissipative. Steepness declined and two bars replaced a single bar profile form. A relationship between pre-existing morphology and subsequent changes in the equilibrium bar/trough morphology was observed during the storm period. Wave characteristics (height, period, steepness, direction, and breaker type) could not be associated

with profile changes. The simultaneous offshore sediment movement across three well-defined zones of the shore-zone suggest that shore-normal edge waves may be the dominant causative agent for these changes. GRA

N84-25241# Naval Underwater Systems Center, Newport, R.I.
OBSERVATIONS OF SEA SURFACE CONDITIONS DURING WEAP (WEAPONS ENVIRONMENTAL ACOUSTICS PROGRAM) EXPERIMENT, MAY 1982: AN EXAMPLE OF REAL-TIME MONITORING OF THE UPPER OCEAN ENVIRONMENT
D. H. Shonting, J. J. Bisagni, and D. J. ONeill 1 Mar. 1984 62 p
(AD-A140021; NUSC-TR-6146) Avail: NTIS HC A04/MF A01 CSCL 08/3

Two environmental monitoring systems that provide information on the geometry, spectra, and directionality of surface waves were tested during an in-water experiment conducted by the Naval Underwater Systems Center. The experiment was carried out as part of the Weapons Environmental Acoustics Program (WEAP) off Block Island, RI, in May 1982. Preliminary results demonstrate the usefulness and reliability of the two systems in remotely measuring sea surface conditions. Wave measurements and other environmental observations made during the experiment are presented, and application of the instrumentation to weapons testing is discussed. GRA

N84-25242# Lamont-Doherty Geological Observatory, Palisades, N. Y.
ONR-SPONSORED MEETING TO DISCUSS SOUTH ATLANTIC AND INDIAN OCEAN PHYSICAL OCEANOGRAPHIC RESEARCH
22 Mar. 1983 94 p
(AD-A140030) Avail: NTIS HC A05/MF A01 CSCL 08/3

Areas of interest in research were prepared for future scheduling. No attempt was made to set priorities nor determine the total amount of ship time and research support available. Areas of interest include the Indian Ocean; south Atlantic Ocean-east; and south Atlantic Ocean-west. B.G.

N84-25243# Marine Research Inst., Helsinki (Finland).
INVESTIGATION OF ICE DYNAMICS IN THE MARGINAL ZONE Final Technical Report, Jan. - Dec. 1983
M. Leppaeranta and W. D. Hibler, III Dec. 1983 106 p
(Contract DAJA45-83-C-0034)
(AD-A138558) Avail: NTIS HC A06/MF A01 CSCL 08/12

Modeling studies were carried through with three types of ice rheologies: free drift, linear viscosity, and plasticity. It is suggested that ice thickness variations may be important to the dispersion of ice edge and lead to e.g., clustering of ice floes. Analytic linear viscous solutions show that variable ice strength rather than variable forcing is likely to produce sharp changes in ice velocity near the ice edge. Steady state ideal plastic solutions give a constant ice flow under constant forcing in the MIZ. In general, ice interaction has a rectifying effect on the flow pattern. Ice kinematics measurements were made with the Del Norte microwave trisponder system in MIZEX-83 Greenland Sea experiment. Differential ice motion was measured with four stations on the ice in the scale of 5 km at three-minute intervals. On several occasions, a rapid slip occurred in measured distances. Ice velocity fluctuations were typically of the order of 1 cm/s and large deformation rates a few percent per hour. Various spectra of differential ice drift showed a moderate inertial peak and a red noise character at higher frequencies, up to about half-hour period. The maximum rate of shear was about twice as large as divergence from 12-h to about 2-h period. GRA

N84-25244# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ARTIFICIAL UPWELLING DRIVEN BY SALINITY DIFFERENCES IN THE OCEAN
D. H. Johnson and J. Decicco Dec. 1983 8 p refs Presented at the ASME Energy Sources Technol. Conf. and Exhibition, New Orleans, 12-16 Feb. 1984
(Contract DE-AC02-83CH-10093)
(DE84-000086; SERI/TP-252-2149; CONF-840201-10) Avail: NTIS HC A02/MF A01

A concept for an artificial upwelling driven by salinity differences in the ocean to supply nutrients to a mariculture farms is described and analyzed. A long shell-and-tube counterflow heat exchanger built of inexpensive plastic and concrete is suspended vertically in the ocean. Cold, nutrient rich, but relatively fresh water from deep in the ocean flows up the shell side of the heat exchanger, and warm but relatively saline water from the surface flows down the tube side. The two flows exchange heat across the thin plastic walls of the tubes, maintaining a constant temperature difference along the heat exchanger. The plastic tubes are protected by the concrete outer shell of the heat exchanger. The flow is maintained by the difference in density between the deep and surface water due to their difference in salinity. This phenomenon was first recognized by the oceanographer Stommel, who termed it The Perpetual Salt Fountain. The heat transfer and flow rate as a function of tube number and diameter is analyzed and the size of the heat exchanger optimized for cost is determined for a given flow of nutrients for various locations. The incremental capital cost of the salinity-driven artificial upwelling is compared to the incremental capital cost and present value of the operating cost of an artificial upwell fueled by liquid hydrocarbons. DOE

N84-25245# National Oceanic and Atmospheric Administration, Princeton, N.J. Geophysical Fluid Dynamics Lab.
GEOPHYSICAL FLUID DYNAMICS LABORATORY ACTIVITIES, FY83, PLANS FY84
Sep. 1983 154 p
(PB84-148790; NOAA-84012504) Avail: NTIS HC A08/MF A01 CSCL 08C

The four major research areas that correspond to NOAA's mission in oceanography and meteorology are covered: weather observation and prediction; climate; air quality; and marine environmental quality. Goals, specific recent achievements and future plans for the following major research categories are given: climate dynamics; middle atmosphere dynamics and chemistry; experimental prediction; oceanic circulation; planetary circulations; observational studies; hurricane dynamics; mesoscale dynamics; convection and turbulence. Author (GRA)

N84-25246# National Oceanic and Atmospheric Administration, Rockville, Md. National Ocean Service.
REPORT TO THE CONGRESS ON OCEAN POLLUTION Technical Report, Oct. 1978 - Sep. 1983
Jan. 1983 34 p refs
(PB84-166768; NOAA-84031201) Avail: NTIS HC A03/M A01 CSCL 08A

Research conducted on the possible long-range effects of pollution, overfishing, and man-induced changes of the ocean ecosystems is reviewed. The effects of oil pollution, trace contaminants polychlorinated biphenyls (PCB), and particulates on marine organisms and marine environments are discussed. Pollution research and monitoring projects for the Great Lakes and various coastal water are also presented. R.S.F.

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-25247# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 18, NO. 2, MARCH - APRIL 1984
O. G. Gazenko, ed. 16 May 1984 152 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 96 p
(JPRS-USB-84-004) Avail: NTIS HC A08

This serial report contains news items, abstracts, and articles of scientific reports on aspect of space biology and aerospace medicine including medical studies on Salyut 6; erthrocyte adhesion; hemodynamic parameters during flight; adaptive effects of immer-

sion on man; hypoxia; metabolism; circadian rhythm; and morphological study of primate muscle fibers. For individual titles, see N84-25248 through N84-25271.

N84-25248# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF DOSIMETRY IN STUDIES OF BIOLOGICAL EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION **c52**

V. N. Karpov, A. A. Galkin, and B. I. Davydov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 3-26 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 7-22 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

In order to clarify mechanisms of biological reactions, the absorption and spatial distribution of the absorbed electromagnetic energy are studied. The procedures and methods of calculating the electromagnetic energy absorption of biological specimens exposed to nonionizing electromagnetic irradiation in a wide frequency range (0 to 300 GHz) are described. Also presented are formulas and plots used in calculating the specific absorption of the dose rate by biological specimens, with the inclusion of resonance polarization of the incident electromagnetic wave, presence of reflecting surfaces and grounding. The extrapolation of the average energy absorption from one animal species to another and to man is discussed. The notion of the irradiation quality coefficient is introduced. The values of the coefficients are given as related to the irradiation frequency and polarization type. A mathematical relation is offered to determine the safety of a complex spectrum of electromagnetic irradiation. Author

N84-25249# Joint Publications Research Service, Arlington, Va.
MAIN RESULTS OF MEDICAL STUDIES ON SALYUT-6--SOYUZ PROGRAM **c52**

Y. I. Vorobyev, O. G. Gazenko, A. M. Genin, N. N. Gurovskiy, A. D. Yegorov, and Y. G. Nefedov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 27-31 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 22-25 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

In 1977 to 1981 the Soviet Union launched 18 manned space missions under the Salyut 6--Soyuz program which included five flights of prime crews for 96, 140, 175, 185 and 75 days and eleven flights of visiting crews. Altogether 30 cosmonauts, including 9 crewmembers from other than the USSR socialist countries, took part in the program. Emphasis was given to the medical investigations, since their purpose was not only to assess the health status of the crew members and to investigate their responses to prolonged weightlessness, but also to identify the maximum allowable flight time. Author

N84-25250# Joint Publications Research Service, Arlington, Va.
BLOOD PLASMA AMINO ACID LEVELS IN COSMONAUTS BEFORE AND AFTER 175-DAY MISSION ABOARD SALYUT-6 **c52**

I. G. Popov and A. A. Latskevich *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 32-41 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 26-33 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

Measurements of 17 free amino acids were performed before and after the Salyut-6 175 day spaceflight. At R+1 both crewmembers showed a reduced concentration of most amino acids as compared to the preflight level. By R+7 the preflight status was not yet reached. Enrichment of the space diet with the following essential amino acids is recommended: preflight-methionine, leucine, isoleucine, phenylalanine, lysine, threonine, cystine and tyrosine; postflight--lysine threonine, valine, leucine, isoleucine, phenylalanine, methionine and cystine. Author

N84-25251# Joint Publications Research Service, Arlington, Va.
EVALUATION OF CHANGES IN HUMAN AXIAL SKELETAL BONE STRUCTURES DURING LONG-TERM SPACEFLIGHTS **c52**

G. P. Stpakov, V. S. Kazeykin, A. P. Kozlovskiy, and V. V. Korolev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 42-47 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 33-37 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

Changes in the mineral content of the left heel bone of the Salyut-6 crewmembers who made 75 to 184 day flights were measured by direct photon absorptiometry. The postflight results were compared with the predicted rate of bone atrophy. This parameter was derived from the data concerning variations in the mineral content of spongy bones of men and animals exposed to actual and simulated weightlessness for various time intervals. The efficiency of countermeasures against the adverse effect of weightlessness on bones was assessed. Crewmembers with a high content of minerals in spongy structures of the axial skeleton and a low basal metabolism should be selected for prolonged space missions. Author

N84-25252# Joint Publications Research Service, Arlington, Va.
STUDY OF ERYTHROCYTE ADHESION IN COSMONAUTS **c52**

A. A. Lentsner, V. I. Brilis, T. A. Brilene, K. P. Lentsner, V. M. Shilov, N. N. Lizko, G. D. Syrykh, and V. I. Legenkov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 48-51 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 38-40 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

The adhesive property of red blood cells of cosmonauts was investigated during various stages of their professional activity. The study was carried out using three test microorganisms: L. casei A6, L. brevis A16 and L. buchneri A14. The results show that the adhesive property of red blood cells varies during different periods of spaceflight. In contrast to long duration flights, short term flights cause greater changes in this parameter. During readaptation the adhesion of red blood cells was significantly increased as compared to that preflight and immediately postflight. Author

N84-25253# Joint Publications Research Service, Arlington, Va.
SANITARY AND HYGIENIC FEATURES OF CABIN ENVIRONMENT IN SALYUT-7 ORBITAL STATION **c54**

S. N. Zaloguyev, V. P. Savina, L. N. Makhamediyeva, Y. G. Nefedov, A. N. Viktorov, M. A. Vytchikova, and T. V. Batenchuk-Tusko *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 52-56 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 40-43 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

The Salyut-7 cabin environment was investigated with respect to the chemical, biological and physical factors. The gas composition was measured qualitatively and quantitatively. This determination showed a higher content of acetone and acetaldehyde when the cosmonauts worked on various trainers and unloaded the Progress cargo vehicles. The time-course study of the toxic impurities indicated that the increase in their content was transient (no more than 4 h). The microbial content was lower than in the Salyut-6 cabin environment. No correlation between the microbial content in the environment and the time the prime crew remained onboard was shown. There was a correlation between the microbial content, temperature variations, and conduct of certain experiments. On the whole, the Salyut-7 cabin environment was normal for the life and work of the crewmembers. Author

N84-25254# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF CHANGES IN METABOLIC AND ENDOCRINE

PROCESSES IN HELICOPTER CREWS DURING COMMERCIAL FLIGHTS c52

I. M. Nosova, T. A. Drobyshevskaya, and N. A. Osadchiyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 57-62 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 43-47 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

Metabolic and hormonal variations of crewmembers of MI-6 and MI-8 helicopters were investigated. The investigation was performed on 61 pilots, including 18 in the hot and 43 in the cold climate. The following parameters were measured before and after flight: nonesterified fatty acids, lactic acid, insulin, and cortisol in blood, and catecholamines and cortisol in urine. In the hot climate the content of nonesterified fatty acids, lactic acid and insulin increased. The renal excretion of catecholamines and cortisol grew drastically. In the cold climate nonesterified fatty acids increased postflight. Insulin, catecholamines and cortisol tended to grow.

Author

N84-25255# Joint Publications Research Service, Arlington, Va.

CHOICE OF PSYCHOPHYSIOLOGICAL CRITERION TO ASSESS WHOLE-BODY LOW-FREQUENCY VIBRATION c52

Y. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 63-67 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 47-50 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

In response to whole-body vibration of 10 Hz and acceleration of 1 m/sq sec applied for 1 hour the psychophysiological status varies in two stages. At stage 1 physiological functions are disturbed (primary disorder) and at stage 2 they recovery partially or completely (compensation and adaptation). The level of compensatory and adaptive reactions is used as a tolerance criterion of the vibration effect with respect to its magnitude and duration. The primary reaction can be used as such a criterion when the functions under study are exposed to direct biomechanical effects of vibration.

Author

N84-25256# Joint Publications Research Service, Arlington, Va.

EVALUATION OF SOME HEMODYNAMIC PARAMETERS OF PILOTS DURING FLIGHTS c52

B. S. Bednenko, G. N. Grechikhin, and A. N. Kozlov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 68-73 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 50-54 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

Coronary circulation and systolic and diastolic time intervals were measured in one-seat high maneuverability aircraft pilots during 22 flights. The effective coronary blood flow values varied significantly and reached maximum during landing. In some cases these changes were very large, suggesting a low level of conditioning and physiological reserves. It is recommended to monitor coronary circulation inflight.

Author

N84-25257# Joint Publications Research Service, Arlington, Va.

SOME PSYCHOLOGICAL CONSEQUENCES OF PROLONGED SOCIAL ISOLATION c53

J. Terelak *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 74-77 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 54-56 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

The environmental conditions of a stay in Antarctica are of great interest from the standpoint of cosmonautics and problems of effects on man's performance of long term isolation related to spaceflight conditions. In an analysis of the process of socioemotional adaptation of a small group that spent the winter in Antarctica, attention was called to a psychophysiologic price of the reaction related to this process. The behavioral disturbances demonstrated which are due to prolonged stays in polar regions, form the winterers' syndrome. The most frequently observed mainfestations of the winterers' syndrome are depression, hostility, irritability, sleep disorders, loss of interest in work, diminished intellectual capabilities and disappearance of interests. In analysis of these symptoms, Mullin indicates the following possible causes of onset: need for long term stay in an isolated group; sameness of environment (monotony, boredom); absence of customary sources of emotional cues. The same features also was noted in laboratory studies simulating spaceflight conditions.

Author

N84-25258# Joint Publications Research Service, Arlington, Va.

ADAPTIVE EFFECTS OF REPEATED IMMERSION ON MAN c52

Y. B. Shulzhenko, V. G. Kozlova, Y. A. Aleksandrova, and K. A. Kudrin *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 78-82 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 57-59 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

The effect of intermittent immersion on orthostatic tolerance, fluid electrolyte metabolism and neuromuscular system was investigated. Control and experimental immersions were used. Experimental immersion was preceded by 12 hour exposure to immersion at night for three times. Experimental immersion was accompanied by reduced renal excretion of fluid, sodium and potassium and normalization of the muscle tone. After experimental immersion orthostatic tolerance approached the control level. The difference in the physiological effects of control and experimental immersions seem to be associated with the capacity of the human body to adapt to immersion, if it is applied intermittently.

Author

N84-25259# Joint Publications Research Service, Arlington, Va.

CIRCADIAN RHYTHM OF HUMAN HEART RATE DURING ANTIORTHOSTATIC TESTS c52

L. Lhagwa *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 83-87 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 60-63 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

The study of diurnal variations of heart rate of seven healthy volunteers exposed to head down tilting (-8 degrees) demonstrated that the absolute value decreased at the peak phase and in the daytime and increased at night. The amplitude of the diurnal variations declined. The experimental data indicate that heart rate may decrease in the morning and in the daytime beginning with the first days of the head down position. Sometimes this decrease may be delayed and develop from seven to twelve days later.

M.A.C.

N84-25260# Joint Publications Research Service, Arlington, Va.

EFFECT OF WORKING IN TWO SHIFTS ON CIRCADIAN RHYTHM OF HEART RATE c52

A. I. Shchukin *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 88-93 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 63-66 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

Circadian variations of the heart rate of 58 male workers, aged from 18 to 21, were investigated. The builders were from different geographical areas and their work record at the construction site was two months, one or two years. The builders whose work record was two months showed an inverted heart rate. The normal increase in the daytime and decrease at night was reversed and night values were greater than daytime values. This can be considered as a manifestation of anxiety due to an early change in the social, geographical and everyday environment. The builders whose work record was one or two years did not show such

changes. The workers who worked in two shifts showed larger amplitudes in the circadian rhythm of heart rate, irrespective of their work record. This can be regarded as a manifestation of stress due to the night shift or continuous changes from one shift to the other. M.A.C.

N84-25261# Joint Publications Research Service, Arlington, Va.
EFFICACY OF CONDITIONING ANIMALS TO HYPOXIA DURING SLEEP

V. B. Malkin and N. F. Landukhova *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 94-99 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 67-70 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

In sleeping animals (sleep induced by the drugs aminasine and elenium) step by step training for 13 days (six hours daily) in an altitude chamber produces a number adaptive changes such as hemopoiesis stimulation, slower weight gain, increased adrenal weight and, most important, elevated altitude tolerance. The state of drug induced sleep can be well used to train for altitude hypoxia. M.A.C.

N84-25262# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL STUDY OF PRIMATE MUSCLE FIBERS AND MICROCIRCULATION DURING HEAD-DOWN HYPOKINESIA **c52**

Y. I. Ilina-Kakuyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 100-103 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 71-73 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

Primates were exposed to head down tilt for seven and 12 days. The body mass and muscle mass decreased, muscles became atrophic, and the number of functioning capillaries lessened. Out of the three muscles examined (gastrocnemius, soleus, and biceps brachii), the soleus muscle showed the greatest changes. In spite of blood redistribution and blood pooling in the upper body, seen during autopsy, no blood displacement occurs in the microcirculatory bed. The decrease in the number of functioning capillaries is normally regarded as a change that is concomitant with muscle atrophy. M.A.C.

N84-25263# Joint Publications Research Service, Arlington, Va.
STRUCTURAL DISTINCTIONS OF THYROID C CELLS AND PARATHYROID GLANDS OF PRIMATES DURING HEAD-DOWN HYPOKINESIA **c52**

G. I. Plakhuta-Plakutina, Y. A. Savina, N. P. Dmitriyeva, Y. A. Amirkhanyan, G. S. Belkaniya, and D. S. Tavadyan *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 104-109 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 73-77 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

Eight monkeys were exposed to head down tilt for seven days and to clinostatic hypokinesia for seven days with subsequent 12 day head down tilt. The C cells found in the thyroid gland and the parathyroid glands of five control and eight experimental monkeys were investigated histologically, morphometrically and electron microscopically. On the seventh tilt day the C cell population increased, their nuclei grew significantly, synthesis activated, and secretory granules accumulated by day 19 most C cells were in the secretion stage. Morphological signs of an increased functional activity of the thyroid gland were seen on experimental day seven and those of the parathyroid gland on day 19, both in light and electron microscopies. Taking into account the antagonism of C cells and parathyroid glands, it is assumed that the hypocalciemic effect of calcitonin plays a part in the stimulation of parathyroid glands during head down tilt. M.A.C.

N84-25264# Joint Publications Research Service, Arlington, Va.
METHOD OF DETERMINING INTENSITY OF ELIMINATION OF MICROORGANISMS FROM HUMAN UPPER RESPIRATORY TRACT

G. O. Pozharskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 110-114 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 78-80 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

The transmission of airborne bacterial diseases by way of the human respiratory tract is investigated. A device to collect and identify the pathogens is described. Aspiration of exhaled air is effected with an attachment consisting of mask, air duct, in the upper third of which valve is installed, and ring fastener, with which the attachment is connected to the air collecting part of Krotov's apparatus. The subject reads aloud a standard text for 4 min. The Krotov's apparatus is turned on with the start of articulation, and air is collected at the rate of 25 liters per minute. This permits complete aspiration of the entire volume of exhaled air on solid nutrient medium in a Petri dish placed in the apparatus. Three groups were studied, using appropriate standard culture techniques for statistical comparison. M.A.C.

N84-25265# Joint Publications Research Service, Arlington, Va.
OXIDATIVE ENZYME ACTIVITY IN RAT BLOOD PLASMA AND SUBCELLULAR FRACTION OF LIVER FOLLOWING FLIGHT ABOARD COSMOS-936 BIOSATELLITE

R. A. Tigranyan and Y. G. Vetrova *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 115-118 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 81-82 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

The activity of the key enzymes of oxidative metabolism malate dehydrogenase (MDH) and isocitrate dehydrogenase (ICDH), in rat blood plasma and subcellular liver fractions after completion of flight aboard Cosmos-936 biosatellite was investigated. The Krebs cycle is the general ultimate route of oxidative catabolism of protein, fats and carbohydrates in living organisms. The activity of different reactions of the Krebs cycle as a whole determines the intensity of oxidative processes in tissues. A comparison of MDH and ICDH activity in blood plasma of rats flown aboard the biosatellite and submitted to weightlessness or artificial gravity (AG) failed to demonstrate changes either in parameters of the above mentioned flight group or in comparison to values for vivarium control animals. The parameters of both groups of rats in the synchronous experiments also failed to reveal changes in activity of the tested enzymes, as compared to the vivarium control. M.A.C.

N84-25266# Joint Publications Research Service, Arlington, Va.
EFFECT OF CENTRIFUGING ON SURVIVAL OF EARLY LARVAE OF COMMON FROGS

E. A. Oygenblik *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 119-122 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 82-84 (For primary document see N84-25247 15-51)

Avail: NTIS HC A08

There are developmental stages sensitive to hypergravity, but reactions of the developing embryo to prolonged and relatively mild exposure was not previously investigated. The effect of accelerations of two, three, and five G forces on the survival of embryos and early larvae of the common frog (Rana temporaria) and the incidence of developmental anomalies is tested. M.A.C.

N84-25267# Joint Publications Research Service, Arlington, Va.
NUCLEIC ACID CONTENT OF CANINE LIVER DURING LONG-TERM EXPERIMENTAL HYPOKINESIA

V. G. Prisenko *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May

1984 p 123-125 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 85-86 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

The quantitative levels of nucleic acids in animal liver cells in the case of prolonged restriction of mobility (from 24 h to 240 days) is investigated. The results of biochemical analysis indicate that long term hypokinesia leads to reduction in quantity of nucleic acids in the liver. The critical period of restricted movement is established at three months, when the nucleic acids have minimum values as compared to normal. Further hypokinesia does not lead to decline in liver cells. M.A.C.

N84-25268# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF EXAM STRESS ON CARDIAC FUNCTION OF STUDENTS DIFFERING IN LEVEL OF PHYSICAL ACTIVITY **c52**

N. Y. Volkind *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 126-129 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 86-87 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

Parameters of cardiac function are studied during final exams in students, athletes and unconditioned subjects. The EKG is recorded in the second standard lead, in seated position. Heart rate is calculated, and the blood pressure is measured. The EKG parameters and blood pressure recorded on the morning after the exams served as the control. Data for 20 people from each group are submitted to statistical processing. High ranking athletes are highly resistant to the stress of examinations. This is indicated by the moderate changes in their cardiac activity during the exams. Unconditioned students present more marked changes in cardiac activity during exams. These changes, as in the athletes, progress as the moment of giving answers draws nearer, and they gradually regress after the students receive their grades. These changes are demonstrable for a number of EKG parameters. M.A.C.

N84-25269# Joint Publications Research Service, Arlington, Va.
MOUSE ADRENAL CORTICOSTERONE CONTENT DURING PROLONGED EXPOSURE TO HIGH-INTENSITY STATIONARY MAGNETIC FIELD

Z. F. Kuzmina *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 130-133 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 87-89 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

The functional state of the adrenal cortex according to its corticosterone levels in the course of prolonged and continuous exposure to high intensity stationary magnetic field SMF is evaluated. The reaction of the adrenocortical system to prolonged exposure to a strong magnetic field is characterized by a specific pattern. The initial intensification of function is followed by adaptation to the contiuously present magnetic field, with a phase of diminished hormone synthesis. With further exposure to this factor, there is a second activation of adrenocortical function.
M.A.C.

N84-25270# Joint Publications Research Service, Arlington, Va.
REVIEW OF BOOK ON SPACE RADIOBIOLOGY **c52**

V. V. Antipov and B. I. Davydov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 134-139 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 89-92 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

Several theoretical theses concerning the validation of radiobiological with respect to levels of radiation to which cosmonauts are exposed during extended space flights are presented. Specific methodology and equipment used in performing radiobiological studies is explained. Topics include a history of radiobiology, physiological reaction to ionizing radiation, radiosensitivity during space flight, and a listing of several radiobiological experiments and their results. M.A.C.

N84-25271# Joint Publications Research Service, Arlington, Va.
NEW BOOK ON METABOLISM UNDER HYPODYNAMIC CONDITIONS **c52**

Y. A. Kovalenko and Y. I. Kondratyev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 140-143 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 92-94 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

The results of metabolism studies in animals during exerimental hypodynamia are summarized. Data on changes in protein, carbohydrate, nucleic and fluid electrolyte metabolism, as well as their regulatory systems in the case of prolonged restriction of movement are analyzed. The hypothesis of biochemical bases of pathogenesis of the hypodynamia syndrome is presented. In addition to data obtained from studies of animal metabolism, material is submitted on the influence of hypodynamia on humans, including spaceflight conditions. The experiments with animals are valuable in that they permit investigation of tissue metabolism proper on different levels. M.A.C.

N84-25272*# National Biomedical Research Foundation, Washington, D. C.
INVESTIGATION OF COMPOUNDS ESSENTIAL FOR THE ORIGIN OF LIFE Final Report, 1 Sep. 1979 - 31 Dec. 1983

Margaret O. Dayhoff and Lois T. Hunt [1983] 35 p
(Contract NASw-3317)
(NASA-CR-173538; NAS 1.26:173538) Avail: NTIS HC A03/MF A01 CSCL 06C

Nucleic acid sequencing as a technique to determine the chemical and biological evolution of certain prokaryotic metabolic pathways is discussed. Protein in data and a microbiological organization of the prokaryotes is included. M.A.C.

N84-25273# Ohio Wesleyan Univ., Delaware. Dept. of Psychology.
FUNCTIONAL ASSESSMENT OF LASER IRRADIATION Annual Progress Report, 1 Jul. 1977 - 30 Jun. 1978

D. O. Robbins Jun. 1978 20 p
(Contract DAMD17-75-C-5008; DA Proj. 3E1-62777-A-878)
(AD-A139490) Avail: NTIS HC A02/MF A01 CSCL 06/18

We have studied the effects of low level coherent light on tectal neural activity in Pseudemys. Irreversible changes in spectral sensitivity and receptive field characteristics were obtained following exposure to coherent light. These effects with coherent light were more significant than the effects of either time-averaged or incoherent light of equal quantal retinal irradiance.
Author (GRA)

N84-25274# Ohio Wesleyan Univ., Delaware. Dept. of Psychology.
FUNCTIONAL ASSESSMENT OF LASER IRRADIATION Annual Progress Report, 1 Jul. 1976 - 30 Jun. 1977

D. O. Robbins Jun. 1977 11 p
(Contract DAMD17-75-C-5008; DA Proj. 3A1-61102-B-71-P)
(AD-A139507) Avail: NTIS HC A02/MF A01 CSCL 06/18

Changes in rhesus spectral and white light acuity following brief (100 msec) laser (647 nm) exposure have been measured. Permanent loss in spectral acuity occurred at an exposure level where white light acuity was still recoverable. These data suggest that postexposure spectral acuity functions reflect altered foveal function rather than total foveal disruption. Author (GRA)

N84-25275# Argonne National Lab., Ill. Chemistry Div.
ENERGY TRANSFER IN REAL AND ARTIFICIAL PHOTOSYNTHETIC SYSTEMS

J. E. Hunt, J. J. Katz, and J. C. Hindman 1984 25 p refs Presented at the US-Japan Information Exchange Seminar on Photochem. Energy Solar Conversion, Okazaki (Japan), 12 Mar.

1984
(Contract W-31-109-eng-38)
(DE84-007278; CONF-840389-1) Avail: NTIS HC A02/MF A01

A comparative study of the fluorescence emitted by three photosynthetic organisms (chlorella, tribonema, and anacystis) and the fluorescence of some model systems selected for study by criteria described below are reported. Light emission was studied as a function of excitation wavelength and of temperature. Low temperature fluorescence studies on photosynthetic organisms and chloroplast preparations provide the chief experimental support for the existence of a photosynthesis II in green plants, and fluorescence at low temperatures was used as the principal source of information on energy flow between the photosynthetic pigments. The nature and functional aspects of PSII and the course of energy transfer in the photosynthetic apparatus are highly pertinent to the oxygen evolution in green plant photosynthesis. DOE

N84-24674*# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. for Flight Medicine.
FREE-FLYER BIOSTACK EXPERIMENT
Horst Buecker *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 139-145 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 06C

N84-24675*# Park (George W.) Seed Co., Inc., Greenwood, S.C.
SEEDS IN SPACE EXPERIMENT (P0004-1)
George B. Park, Jr. and Jim A. Alston *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 146-147 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 06C

N84-24676*# National Aeronautics and Space Administration, Washington, D. C.
SPACE-EXPOSED EXPERIMENT DEVELOPED FOR STUDENTS
Doris K. Grigsby *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 148-150 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 06C

N84-25589*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LABELED CELLS AS RESEARCH, DIAGNOSTIC AND THERAPEUTIC TOOLS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 4-5 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06C

N84-25590*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMPUTER-ASSISTED CHROMOSOME ANALYSIS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 6-7 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06C

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-25276 Royal Naval Personnel Research Committee, London (England).
MOTION ILLNESS: A BIBLIOGRAPHY
Carol A. Muir Sep. 1983 118 p
(AD-A139342; SMWP-1/83; BR90380) Avail: Issuing Activity CSCL 06/5

A bibliography containing 415 citations relating to motion sickness research is presented. Particular reference is given to the prevention of motion illness by drug treatment. Limitations of the data collected to determine the relationship between motion and illness are discussed. A general review of the methods of the drug trials completed in the field of motion illness is included. Specific topics which receive consideration include: space flight stress, weightlessness, angular acceleration, linear acceleration, symptoms of motion sickness, and vestibular nystagmus. R.S.F.

N84-25277# Committee on Science and Technology (U. S. House).
BIOLOGICAL CLOCKS AND SHIFT WORK SCHEDULING
Washington GPO 1984 44 p refs Presented by the Subcomm. on Invest. and Oversight to the Comm. on Sci. and Technol., 98th Congr., 2d Sess., Jan. 1984
(GPO-29-312) Avail: Subcommittee on Investigations and Oversight

The current status of research on the effects of rotating shift work on human performance is examined. A brief survey on circadian rhythms and the problems experienced by workers on rotating shifts is presented. Suggestions for work schedules that minimize some of the problems such as insomnia, chronic fatigue, physiological ailments, and reduced alertness are included with provisions for management training in the understanding of biological clocks. M.A.C.

N84-25278# Yale Univ., New Haven, Conn. Dept. of Ophthalomology and Visual Science.
LIMITS OF PATTERN DISCRIMINATION IN HUMAN VISION Annual Report, 1 Jan. 1983 - 30 Jan. 1984
J. Hirsch 30 Jan. 1984 51 p
(Contract F49620-83-C-0026; AF Proj. 2313)
(AD-A139921; AFOSR-84-0183TR; AR-1) Avail: NTIS HC A04/MF A01 CSCL 05/10

The studies reported in Annual Technical Report 1 were designed to probe various aspects of spatial pattern discrimination. Several important findings have emerged allowing limits of pattern discrimination to be related to structural properties of the photoreceptor lattice. First, our findings have suggested that spatial frequency discrimination exceeds resolution of the photoreceptor mosaic for spatial frequencies above approximately 4 c/deg, thus spatial frequency discrimination qualifies as a hyperacuity task. Further, spatial frequency discrimination was not a smooth function of spatial frequency, but rather showed a regularly segmented structure that appeared to be related to foveal photoreceptor center-to-center spacing. This result suggests that the photoreceptor lattice could be the primary geometrical instrument for estimating distance or separations between stimulus features. We have developed a technique to study the structural quality of a retinal mosaic by digitizing the foveal photoreceptor lattice of a primate (Macacca fascicularis). Our analyses of the foveal region has revealed a very high quality hexagonal lattice with a correlation length of at least 130 photoreceptors. These results confirm that the photoreceptor lattice is constructed with sufficient structural quality to provide a source of geometrical information reflected in spatial discrimination tasks. GRA

N84-25279# Consiglio Nazionale delle Ricerche, Pisa (Italy). Inst. di Neurofisionlogia.
PROCEEDINGS OF THE 6TH EUROPEAN CONFERENCE ON VISUAL PERCEPTION Final Report, 15 Aug. 1983 - 14 Feb. 1984
Adriana Fiorentini 30 Nov. 1983 82 p Conf. held at Lucca, Italy, 28-31 Aug. 1983
(Grant AF-AFOSR-0263-83; AF Proj. 2313)
(AD-A139927; EOARD-TR-84-09) Avail: NTIS HC A05/MF A01 CSCL 05/10

The '6th European Conference on Visual Perception' has dealt with the following topics: spatial and temporal frequencies, color, visual physiology (cortical and subcortical), motion perception, binocular interactions, stereopsis and oculomotor proprioception. GRA

N84-25280# SRI International Corp., Menlo Park, Calif.
USAFSAM (USAF SCHOOL OF AEROSPACE MEDICINE) REVIEW AND ANALYSIS OF RADIOFREQUENCY RADIATION

BIOEFFECTS LITERATURE Interim Report, 17 May 1982 - 16 Jun. 1983
L. N. Heynick and P. Polson Mar. 1984 179 p
(Contract F33615-82-C-0610; AF Proj. 7757)
(AD-A140023; USAFSAM-TR-84-6; Rept-3) Avail: NTIS HC A09/MF A01 CSCL 06/18

The objectives of this project are to acquire, review, and analyze, on an ongoing basis, information on research pertaining to the biological effects of radiofrequency radiation (RFR) for the preparation of a computer data base of analyses at the USAF School of Aerospace Medicine (USAFSAM). The method in use is to: (1) select documents judged to be representative of prior and current research on various RFR-bioeffects topics, (2) analyze in detail the contents of each such document, and (3) assess the validity and significant of the results presented. In this third report, the major RFR-bioeffects topics are listed and the revised format used for analyzing each selected document is described. During the period covered by this report, 38 additional analyses were completed, for a total of 118 analyses. The texts of the additional analyses are presented in Appendix A. Since the issuance of the first two reports, the analyses contained therein have been assigned identification numbers 1 through 80, and the sequence is continued for the analyses in Appendix A. In addition, to the text, each analysis includes information for computer retrieval by authors, key words, year of publication, and RFR parameters. A master citation list of all 118 analyses completed thus far is given in Appendix B. This is arranged alphabetically by first author. GRA

N84-25281# Army Research Inst. of Environmental Medicine, Natick, Mass.
INFLUENCE OF HYDRATION LEVEL AND BODY FLUIDS ON EXERCISE PERFORMANCE IN THE HEAT
M. N. Sawka, R. P. Francesconi, A. J. Young, and K. B. Pandolf Jan. 1984 31 p
(DA Proj. 3E1-62777-A-879)
(AD-A139284; USARIEM-M-11-84) Avail: NTIS HC A03/MF A01 CSCL 06/19

During exercise in the heat, sweat output often exceeds water intake resulting in hypohydration which is defined as a body fluid deficit. This fluid deficit is comprised of water loss from both the intracellular and extracellular fluid compartments. Hypohydration during exercise causes a greater heat storage and reduces endurance in comparison to euhydration levels. The greater heat storage is attributed to a decreased sweating rate as well as a decreased cutaneous blood flow. These response decrements have been related to both plasma hyperosmolality and a plasma hypovolemia. Subject gender, acclimation state and aerobic fitness do not alter the hypohydration response. Hyperhydration, or body fluid excess, does not appear to provide a clear advantage during exercise-heat stress, but may delay the development of hypohydration. GRA

N84-25282# Army Research Inst. of Environmental Medicine, Natick, Mass.
EFFECTS OF HEAT ACCLIMATION ON ATROPINE IMPAIRED THERMOREGULATION
M. A. Kolka, L. Levine, B. S. Cadarette, P. Rock, and M. N. Sawka 1983 19 p
(DA Proj. 3M1-62734-A-875)
(AD-A139292; USARIEM-M12/84) Avail: NTIS HC A02/MF A01 CSCL 06/19

The effects of saline or atropine injection (2 mg, im) on eccrine sweating and performance time in seven healthy male subjects were evaluated during treadmill walking in a hot-dry environment, before and after heat acclimation. Mean skin temperature, rectal temperature, and heart rate were continuously measured. Data demonstrated that heat acclimation improves the endurance time of atropine-treated subjects in a hot-dry environment. This improvement was in part due to the potentiation of sweat gland activity enabling greater evaporative cooling for the same dose of atropine. GRA

N84-25283# Information Ventures, Inc., Philadelphia, Pa.
BIOLOGICAL EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION. VOLUME 8, NUMBER 1: A DIGEST OF CURRENT LITERATURE
B. H. Kleinstein Oct. 1983 115 p
(Contract N00014-83-C-0004)
(AD-A139296) Avail: NTIS HC A06/MF A01 CSCL 06/18

The literature digest contains original abstracts of English and foreign-language research literature, current research summaries, news items and announcements and information on relevant meetings and conferences. Subject and author indices are provided for all literature abstracts. Original abstracts are prepared based on data presented in the text, tables, and figures in the document. Where appropriate, quantitative data such as wavelength or frequency modulation, pulse width, duty cycle, incident power density, specific absorption rate, drugs or other stimulate, exposure duration and regime, and end point are included in each abstract. GRA

N84-25284# Army Research Inst. of Environmental Medicine, Natick, Mass.
SKELETAL MUSCLE METABOLISM OF SEA-LEVEL NATIVES FOLLOWING SHORT-TERM HIGH-ALTITUDE RESIDENCE
A. J. Young, W. J. Evans, E. C. Fisher, R. L. Sharp, and D. L. Costill Feb. 1984 20 p
(DA Proj. 3E1-62777-A-879)
(AD-A139323; USARIEM-M-13-84) Avail: NTIS HC A02/MF A01 CSCL 06/19

The influence of short-term high-altitude (HA) residence on intramuscular pH and skeletal muscle enzyme activity of sea-level (SL) residents was investigated. Vastus lateralis muscle samples were obtained by biopsy from rested subjects (n-5) at SL (50M) and on the eighteenth day of HA residence (4300 m) for determination of glycogen phosphorylase, hexokinase, malate dehydrogenase and total lactate dehydrogenase activities. A second group of subjects (n-6) performed cycle exercise of the same absolute intensity at SL and on the fifteenth day of residence at HA. The first group of subjects showed no significant changes in skeletal muscle enzyme activity laser after 18 days at HA. The second group of subjects were instructed to exercise for exactly 30 min, and all but one could complete the entire bout at SL. However, at HA, none could continue 30 min, and time to exhaustion was 11.9 + or - 1.6 min. Resting intramuscular pH was not significantly different after HA residence as compared to SL. The fall in intramuscular pH was less with exercise on day 15 at HA than during SL exercise. Likewise, the increase in blood lactate concentration with exercise at HA was less than at SL. These data indicate that, after 15-18 days of HA residence, limitations in exercise performance are not due to inordinate intramuscular acidosis or to changes in the activity of glycolytic and oxidative enzymes. GRA

N84-25285# Naval Medical Research Inst., Bethesda, Md.
A NON-DIMENSIONAL ANALYSIS OF CARDIOVASCULAR RESPONSE TO COLD STRESS. PART 1: IDENTIFICATION OF THE PHYSICAL PARAMETERS THAT GOVERN THE THERMOREGULATORY FUNCTION OF THE CARDIOVASCULAR SYSTEM Medical Research Progress Report, Jun. - Sep. 1983
D. J. Schneck 1 Sep. 1983 93 p
(MR04101)
(AD-A138710; NMRI-83-51) Avail: NTIS HC A05/MF A01 CSCL 06/19

Whether in combat-type situations, or during peace-time, Man constantly strives to increase the envelope of human performance capabilities. One environmental factor that appears to seriously impede such capabilities is the ambient temperature within which the performance takes place. Cold stress and/or the consequences of hypothermia can lead to adverse effects that range from severe impairment of physiological function to death, itself. The prevailing belief today is that vascular changes and tissue hypoxia are directly responsible for all types of local cold injury, and that variation in the clinical features or manifestations reflects variation

in the nature of the insult and the host response. With this in mind, this study has examined the human cardiovascular system in terms of its four basic elements: The fluid (blood), the pump (Heart), the flow pipes (vascular system), and the control mechanisms (intrinsic factors, the central and autonomic nervous systems, and the endocrine system). Then, cardiovascular thermoregulation has been described in terms of how each of these elements responds to cold stress, with the ultimate intent of performing a non-dimensional analysis of the response. As a first step towards such an analysis, some 400 physical and chemical parameters that govern the thermoregulatory function of the cardiovascular system have been identified. GRA

N84-25248# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF DOSIMETRY IN STUDIES OF BIOLOGICAL EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION
V. N. Karpov, A. A. Galkin, and B. I. Davydov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 3-26 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 7-22 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25249# Joint Publications Research Service, Arlington, Va.
MAIN RESULTS OF MEDICAL STUDIES ON SALYUT-6--SOYUZ PROGRAM
Y. I. Vorobyev, O. G. Gazenko, A. M. Genin, N. N. Gurovskiy, A. D. Yegorov, and Y. G. Nefedov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 27-31 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 22-25 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25250# Joint Publications Research Service, Arlington, Va.
BLOOD PLASMA AMINO ACID LEVELS IN COSMONAUTS BEFORE AND AFTER 175-DAY MISSION ABOARD SALYUT-6
I. G. Popov and A. A. Latskevich *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 32-41 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 26-33 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25251# Joint Publications Research Service, Arlington, Va.
EVALUATION OF CHANGES IN HUMAN AXIAL SKELETAL BONE STRUCTURES DURING LONG-TERM SPACEFLIGHTS
G. P. Stpakov, V. S. Kazeykin, A. P. Kozlovskiy, and V. V. Korolev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 42-47 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 33-37 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25252# Joint Publications Research Service, Arlington, Va.
STUDY OF ERYTHROCYTE ADHESION IN COSMONAUTS
A. A. Lentsner, V. I. Brilis, T. A. Brilene, K. P. Lentsner, V. M. Shilov, N. N. Lizko, G. D. Syrykh, and V. I. Legenkov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 48-51 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 38-40 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25254# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF CHANGES IN METABOLIC AND ENDOCRINE PROCESSES IN HELICOPTER CREWS DURING COMMERCIAL FLIGHTS
I. M. Nosova, T. A. Drobyshevskaya, and N. A. Osadchiyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 57-62 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 43-47 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25255# Joint Publications Research Service, Arlington, Va.
CHOICE OF PSYCHOPHYSIOLOGICAL CRITERION TO ASSESS WHOLE-BODY LOW-FREQUENCY VIBRATION
Y. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 63-67 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 47-50 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25256# Joint Publications Research Service, Arlington, Va.
EVALUATION OF SOME HEMODYNAMIC PARAMETERS OF PILOTS DURING FLIGHTS
B. S. Bednenko, G. N. Grechikhin, and A. N. Kozlov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 68-73 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 50-54 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25258# Joint Publications Research Service, Arlington, Va.
ADAPTIVE EFFECTS OF REPEATED IMMERSION ON MAN
Y. B. Shulzhenko, V. G. Kozlova, Y. A. Aleksandrova, and K. A. Kudrin *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 78-82 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 57-59 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25259# Joint Publications Research Service, Arlington, Va.
CIRCADIAN RHYTHM OF HUMAN HEART RATE DURING ANTIORTHOSTATIC TESTS
L. Lhagwa *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 83-87 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 60-63 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25260# Joint Publications Research Service, Arlington, Va.
EFFECT OF WORKING IN TWO SHIFTS ON CIRCADIAN RHYTHM OF HEART RATE
A. I. Shchukin *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 88-93 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 63-66 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25262# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL STUDY OF PRIMATE MUSCLE FIBERS AND MICROCIRCULATION DURING HEAD-DOWN HYPOKINESIA
Y. I. Ilina-Kakuyeva *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 100-103 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 71-73 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25263# Joint Publications Research Service, Arlington, Va.
STRUCTURAL DISTINCTIONS OF THYROID C CELLS AND PARATHYROID GLANDS OF PRIMATES DURING HEAD-DOWN HYPOKINESIA
G. I. Plakhuta-Plakutina, Y. A. Savina, N. P. Dmitriyeva, Y. A. Amirkhanyan, G. S. Belkaniya, and D. S. Tavadyan *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 104-109 refs Transl.

into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 73-77 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25268# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF EXAM STRESS ON CARDIAC FUNCTION OF STUDENTS DIFFERING IN LEVEL OF PHYSICAL ACTIVITY
N. Y. Volkind *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 126-129 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 86-87 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25270# Joint Publications Research Service, Arlington, Va.
REVIEW OF BOOK ON SPACE RADIOBIOLOGY
V. V. Antipov and B. I. Davydov *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 134-139 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 89-92 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25271# Joint Publications Research Service, Arlington, Va.
NEW BOOK ON METABOLISM UNDER HYPODYNAMIC CONDITIONS
Y. A. Kovalenko and Y. I. Kondratyev *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 140-143 Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 92-94 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

N84-25593*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIGITAL IMAGE PROCESSING OF MUSCLE BIOPSIES
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 12-13 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06P

N84-25594*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ARTIFICIAL BLOOD SUBSTITUTES
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 14-15 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06A

N84-25597*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ULTRASOUND VISUALIZATION OF CARDIOVASCULAR SYSTEMS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 20-21 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06B

N84-25598*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COMPUTER-AIDED ANALYSIS OF ATHEROSCLEROSIS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 22-23 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06E

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-25286# Navy Personnel Research and Development Center, San Diego, Calif.
COMPUTER-MANAGED INSTRUCTION: INDIVIDUAL DIFFERENCES IN STUDENT PERFORMANCE Interim Report, Oct. 1982 - Sep. 1983
P. A. Federico Feb. 1984 22 p
(F63-522)
(AD-A139708; NPRDC-TR-84-30) Avail: NTIS HC A02/MF A01 CSCL 05/9

To determine whether individual differences in student achievement and learning rate are reduced or eliminated by mastery instruction, 166 Navy trainees who had completed a computer-managed course in basic electricity and electronics were cluster-analyzed into groups, using 24 measures of cognitive characteristics. Discriminant analyses were computed between the two derived groups using module test scores and completion times. Groups differed significantly in their achievement in 4 out of 11 modules and in the time required to complete 1 module, but did not demonstrate a progressive decrease in the variability of their achievement and learning rates. Author (GRA)

N84-25287# New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Education.
UNDERSTANDING PICTURE-TEXT INSTRUCTIONS Final Report, 1 Mar. 1980 - 31 Mar. 1984
M. D. Glock, G. R. Bieger, T. Crandell, M. Knowlton, and F. Schorr 31 Mar. 1984 27 p Prepared in cooperation with Cornell Univ., Ithaca, N.Y., and Bucknell Univ., Lewisburg, Pa.
(Contract N00014-80-C-0372; RR0-4206)
(AD-A139746; TR-12-SER-B) Avail: NTIS HC A03/MF A01 CSCL 05/10

This project investigated a variety of aspects of how procedural instructions comprised of text and pictures are comprehended and executed. The research focused on differences in comprehension and performance attributable to variations in the organization of the information, the format of the information, the metacognitive strategies employed by readers, and the interaction of readers with materials. The various studies confirmed that differences in comprehension and performance are related to these factors. Several categories of information were found to be very important if not essential for execution of procedural instructions, and it was further found that certain metacognitive strategies affected the speed and accuracy of performance. Additional investigations revealed that subjects rely on specific features of objects for purposes of identification and use those features to infer functional properties of the objects depicted. These findings are discussed in terms of a recursive model of the cognitive processing of picture-text information and implications for the design of instructional materials are discussed. Author (GRA)

N84-25288# Decisions and Designs, Inc., McLean, Va.
PSYCHOLOGICAL RESEARCH ON ADVANCED TERRAIN REPRESENTATION: FORMATTING THE VISUAL MATERIAL
R. N. Kraft, J. F. Patterson, and N. B. Mitchell Mar. 1984 111 p
(Contract MDA903-81-C-0568; DA Proj. 2Q1-62717-A-790)
(AD-A139782; DDI/PR-82-9-331; ARI-RN-84-68) Avail: NTIS HC A06/MF A01 CSCL 05/9

This report describes an empirical investigation which was done to guide the development of a videodisc based system that will provide free travel from a ground-level perspective within a simulated environment. The Advanced Terrain Representation (ATR) system will be based on a generalization of surrogate travel. The purpose of conducting this psychological research was to provide the bounds of perceptual acceptability for guiding subsequent technological development. Ideally, ATR would present a complete and veridical representation of the natural tactical environment; however, because of storage constraints inherent in videodisc technology, the amount of information which can be presented is limited. Psychological research was conducted to help produce a compelling, pedagogically effective system within these constraints. The primary research question was as follows: what is the most efficient way to represent a large piece of terrain in a perceptually informative fashion? A short summary of the findings indicate that the camera lens angle at which a picture is taken drives the estimation of distances from the observer to a point in the picture, but not the distance between two points in a

photograph; the acceptable jump size is a function of the type of terrain; and the number of acceptable viewing and travel directions are narrowly constrained. GRA

N84-25289# Bernard Baruch Coll., New York.
BRAIN RESPONSES AND INFORMATION PROCESSING IV. INVESTIGATIONS OF HEMISPHERIC ASYMMETRY IN EVENT RELATED POTENTIALS AND PERFORMANCE DURING DISCRIMINATION OF LINE ORIENTATION, COLOR, SHAPE AND UNDER VISUAL MASKING Final Annual Report, 1 Oct. 1979 - 30 Sep. 1983
J. L. Andreassi and N. M. Juszczak 30 Nov. 1983 84 p
(Contract F49620-80-C-0013; AF Proj. 2313)
(AD-A139797; AFOSR-84-0182TR; FAR-4) Avail: NTIS HC A05/MF A01 CSCL 05/10

The research completed over the last twelve months has included a number of studies concerned with evoked cortical potential correlates of visual stimulus processing in humans. The first experiment was conducted in order to replicate an earlier finding in which the amplitude of a relatively late positive component of the event related potential (ERP), known as the P3, was larger to a line orientation that required a yes response than one that required a no. The angular difference between the two lines was only 5 degrees. Another purpose was to assess the reliability of the better right hemisphere performance found with male subjects in the line orientation discrimination task used. In a second experiment, we examined the possibility of hemispheric asymmetry in response to two different colors (red and blue). The two hemispheres responded in essentially the same manner to the two colors. However, an interesting finding was the larger ERPs of both left and right hemispheres to the color blue, especially with central visual field stimulation. A third experiment was directed at the determination of whether the right hemisphere would be more sensitive to visual masking than the left, especially with a metacontrast paradigm which is dependent on spatial factors to produce the masking effect. A fourth experiment was performed to determine the relative responsivity of the two hemispheres to verbal (letter) and spatial (geometric form) stimuli. GRA

N84-25290# Illinois Univ., Urbana. Urbana Computer-based Education Research Lab.
DIMENSIONALITY, SCORING, AND RELATED PROBLEMS IN ADAPTIVE TESTING Final Report
J. M. Eddins, K. Tatsuoka, and M. Tatsuoka Jan. 1984 30 p
(Contract N00014-79-C-0752; NR Proj. 154-445; RR04204)
(AD-A139849; CERL-FR-83-5-ONR) Avail: NTIS HC A03/MF A01 CSCL 05/10

Major efforts of the project fall into four categories. The relationship between the dimensionality of a data set and its underlying cognitive processes was investigated. Two approaches for diagnosing erroneous rules of operation were developed; an error vector system for constructing error diagnostic programs for signed number arithmetic and fraction addition problems, and a series of logical statements for constructing diagnostic programs for fraction problems; to circumvent the problems encountered in the construction of error diagnostic programs, two indices based on deterministic Guttman theory were formed and used to detect aberrant response patterns; and the necessity for dealing quantitatively with variations in errors and changing rules of operation led to the investigation of probabalistic models for error diagnosis based on item response theory. GRA

N84-25291# Navy Personnel Research and Development Center, San Diego, Calif.
COMPUTER-MANAGED INSTRUCTION: STABILITY OF COGNITIVE COMPONENTS Interim Report, Oct. 1982 - Sep. 1983
P. A. Federico Feb. 1984 31 p
(DA Proj. F63-522)
(AD-A139881; NPRDC-TR-84-29) Avail: NTIS HC A03/MF A01 CSCL 05/9

To ascertain changes in cognitive correlates of learning as students advance through hierarchical instruction, 24 individual difference measures were obtained from 166 Navy trainees who had completed a computer-managed course in electricity and electronics. Principal component analysis and varimax rotation were computed for cognitive characteristics, producing factor scores that were used in multiple regression analyses to predict achievement in 11 modules of instruction. During acquisition of course content, cognitive components sampled shifted noticeably in importance throughout the curriculum. The results have implications for aptitude-treatment-interaction (ATI) research, transition from novice to expert, crystallized and fluid intelligence, task demands of instruction, and computer-managed mastery learning.
Author (GRA)

N84-25292# Naval Training Analysis and Evaluation Group, Orlando, Fla.
THE DESIGN AND PRODUCTION OF A PROCEDURE TRAINING AID USING THE PROCEDURE LEARNING FORMAT AND THE COMPUTER AUTOMATED PAGE LAYOUT (PLA) ROUTINE
W. R. Terrell, R. C. Ewell, P. Scott, and R. Braby Dec. 1983 78 p
(AD-A139988; TAEG-TN-12-83) Avail: NTIS HC A05/MF A01 CSCL 05/9

The rapid introduction of increasingly complex military equipment has resulted in a major requirement for the timely development of more effective materials to train personnel in the performance of operation and maintenance procedures. The Training Analysis and Evaluation Group (TAEG) of the Naval Training Equipment Center has developed a learning format which increases the efficiency with which procedures are taught. This format relies heavily on graphics and uses words where necessary to clarify the meaning of the graphics. While documents based on the format are highly successful as procedure training aids and job performance aids these documents are expensive and time consuming to design and produce. The TAEG has responded to this problem by developing the computer automated page layout system, which significantly reduces the time and effort required to produce text graphic materials. The computer automated page layout (PLA) for text-graphic materials user's guide provides the subject matter expert an independent means to learn to use these computer routines to design and produce training aids. This report describes the field application of the PLA to the development of a procedure training aid for the SH-3D/H Helicopter. The demonstration is part of the TAEG development effort to provide tools for the design and publication of training aids. GRA

N84-25293# Stanford Univ., Calif. Dept. of Computer Science.
GUIDON: A COMPUTER-AIDED INSTRUCTIONAL PROGRAM
W. J. Clancey Nov. 1983 16 p
(Contract N00014-79-C-0302)
(AD-A139999; SU-SU-STAN-CS-83-997; SU-TR-9) Avail: NTIS HC A02/MF A01 CSCL 05/9

An intelligent computer-aided instruction (ICAI) program for teaching diagnosis is described. The program, called GUIDON, can discuss with a student any diagnostic problem (e.g., medical diagnosis) that it can solve on its own. By substituting problem solving knowledge from other domains, the program can immediately discuss problems in those domains. This capability derives from the use of artificial intelligence methods for representing both subject material and knowledge of how to teach. The advantages of separate, explicit representations of both teaching knowledge and subject material are discussed. R.S.F.

N84-25294# Naval Biodynamics Lab., New Orleans, La.
MASSED PRACTICE: DOES IT CHANGE THE STATISTICAL PROPERTIES OF PERFORMANCE TESTS? Research Report
M. Krause and J. C. Woldstad Jun. 1983 33 p
(F58524; M0933)
(AD-A139338; NBDL-83R005) Avail: NTIS HC A03/MF A01 CSCL 05/10

Repeated trials on a task are frequently required for assessing training procedures or experimental treatments. Limited time, money, or availability of research subjects often result in the need to give a substantial number of trials on a task within a short period of time. However, in many laboratories repeated measures

are traditionally separated by 24 hours or more to reduce the chances of fatigue, interference, or other factors introducing undesirable error variance. Massing practice is an obvious alternative to distributing it, particularly when time constraints exist. However, massed practice is only a desirable alternative if the resulting test scores maintain the statistical properties required for repeated measures analysis. Paper-and-pencil and computerized versions of traditional human performance tests were examined under massed practice conditions. Many of the tests had been shown to have high reliabilities and to meet the statistical requirements for repeated measures applications under distributed practice conditions in earlier studies at our laboratory. It is recommended that distributed practice with trials separated by 24 hours or more be used whenever feasible. If massed practice is required tasks should be chosen which have been shown to have high reliability and which meet the statistical requirements for repeated measures experimentation. It is expected that once computer tasks are refined they too will lend themselves to massed practice administration when required. GRA

N84-25295# Pomona Coll., Claremont, Calif.
VISUAL ORGANIZATION AND INFORMATION PROCESSING
W. P. Banks Jun. 1983 10 p refs
(Contract MH-33279)
(PB84-170778; NIMH-84-382) Avail: NTIS HC A02/MF A01 CSCL 05J

The relation between visual organization and perception was analyzed and a theoretical account of this relation was developed. Target detection was shown to be improved if the experiment contained a memory component. Perceptual and memory-based discriminations among things show very different results, indicating that the memory comparisons do not use little replicas of physical objects. Author (GRA)

N84-25257# Joint Publications Research Service, Arlington, Va.
SOME PSYCHOLOGICAL CONSEQUENCES OF PROLONGED SOCIAL ISOLATION
J. Terelak *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 74-77 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 54-56
(For primary document see N84-25247 15-51)
Avail: NTIS HC A08

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-25296# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
A MULTIVARIATE AUTOREGRESSIVE DISPLAY MONITORING MODEL
Paul Milgram 6 Oct. 1983 24 p refs Presented at 3rd European Ann. Conf. on Human Decision Making and Manual Control, Roskilde, Denmark, 30 May - 1 Jun. 1983
(NLR-MP-83033-U) Avail: NTIS HC A02/MF A01

Multivariate autoregressive (AR) time series models were used for the normative modelling of the visual monitoring behavior and anomaly detection performance of a human operator (HO) observing a correlated multi-instrument display system. The relationship between the AR repesentation and both older nonparametric scanning models and more recent state space cum Kalman filter formulations is discussed. Concerning the latter relatonship, there are benefits with the AR model principally with respect to identification of the underlying physical system and to the problem (primarily computational) of attributing to HO a low order internal model of a (in reality) high order system. Both average and dynamic monitoring behavior were modellable, the former in terms of spectral relationships and relative uncertainty (redundancy) and the latter in terms of predictions of probability of limit exceedence and likelihood of the occurrenc of deterministic anomalies. The optimal predictive capabilities of the model are discussed. A computationally efficient recursive algorithm was developed for computing a matrix function of estimation error covariances (i.e., uncertainty), dependent only upon statistical model identification and recent scanning history. Author

N84-25297# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5
HUMAN FACTORS IN WEAPON SYSTEMS
Bengt Bergstroem, ed. and Jeanette Palm, ed. Feb. 1984 95 p refs In SWEDISH and ENGLISH Proc. of Symp., Stockholm, 13 Apr. 1983; Sponsored by Research Inst. of National Defence (FOA) 56
(FOA-A-56006-H2; ISSN-0281-0239) Avail: NTIS HC A05/MF A01

A conference on Human Factors in Weapon Systems, held 1983-04-13 in Stockholm is reported. The symposium was arranged by the Human Factors Division of National Defence Research Institute. Topics discussed include: human factors engineering and product development; human factors in weapon systems; and flight plans. E.A.K.

N84-25298# Trinity Coll., Dublin (Ireland). Dept. of Psychology.
PROLONGED HEAVY VEHICLE DRIVING PERFORMANCE: EFFECTS OF UNPREDICTABLE SHIFT ONSET AND DURATION AND CONVOY VERSUS INDEPENDENT DRIVING CONDITIONS Final Technical Report
Raymond G. C. Fuller Sep. 1983 126 p
(Grant DA-ERO-78-G-006; DA Proj. 2Q1-61102-B-74-F)
(AD-A139747; ARI-TR-585) Avail: NTIS HC A07/MF A01 CSCL 05/10

Truck driver safety was studied under conditions of prolonged normal driving, prolonged continuous convoy during under conditions of task uncertainity. In all experiments drivers were required to drive an experimental truck for four consecutive days. Dependent variables were driver performance, self ratings, and endocrine changes. Apart from changes over time, where possible the effects of age and time of work period onset were determined. Symptoms of fatigue were most typical of the end of the driving shift, becoming evident from about the 9th hour of driving, and were particularly characteristic of older drivers on a shift finishing at 02.30 hours. Nevertheless the requirement to drive 11 hours per day for 4 consecutive days did not lead to conspicuous deterioration in driving performance under normal driving conditions. Even under continuous convoy driving such prolonged work did not produce impairment but elicited compensatory adjustments toward the end of the late shift. Finally, task uncertainity was not found to induce earlier fatigue. Drivers appeared to adjust to this condition by covertly anticipating a demand in excess of actual requirement. A behavioral analysis of the driving task was proposed and among other features its implications for driver fatigue and traffic accidents were discussed. Author (GRA)

N84-25299# Virginia Polytechnic Inst. and State Univ., Blacksburg.
HUMAN-COMPUTER INTERACTIONS AND DECISION BEHAVIOR Final Report
R. C. Williges, R. W. Ehrich, B. H. Williges, H. R. Hartson, and J. S. Greenstein Jan. 1984 65 p
(Contract N00014-81-K-0143; DA Proj. RR0-4209)
(AD-A139759; CSIE-83-16) Avail: NTIS HC A04/MF A01 CSCL 05/8

This is the final report of a three year research program directed toward understanding and improving human-computer dialogue. This report provides an overview of the research program, the scientific personnel who worked on the project, the major scientific accomplishments, the list of reports and archival publications, the technical information exchange, the interdisciplinary graduate training and the project impact for future research. Author (GRA)

N84-25300# Illinois Univ., Urbana. Coordinated Science Lab.
AN EXPERT DISTRIBUTED ROBOTICS SYSTEM WITH COM-

PREHENSION AND LEARNING ABILITIES IN THE AIRCRAFT FLIGHT DOMAIN Annual Technical Report, 1 Jan. - 31 Dec. 1983
D. L. Waltz and G. F. DeJong Feb. 1984 43 p
(Contract F49620-82-K-0009; AF Proj. 2304)
(AD-A139826; T-138; AFOSR-84-0185TR) Avail: NTIS HC A03/MF A01 CSCL 06/4

Research has continued during the past year on critical components for a comprehensive expert system for on-board use in an aircraft. The investigators report on a system that can reason about the operation of a gas turbine engine; a system about route and trajectory meta-planning; a temporal reasoning system; a system for extracting speaker goals from natural language dialogue; systems for acquiring new knowledge schemas from natural language input; and systems for high level perceptual reasoning. GRA

N84-25301# Naval Postgraduate School, Monterey, Calif.
AN INTERNAL REVIEW AND OPERATIONAL TRIAL OF A HUMAN FACTORS ENGINEERING SELF-PACED COURSE IN ACCORDANCE WITH THE INSTRUCTIONAL SYSTEMS DEVELOPMENT PROCESS M.S. Thesis
M. M. Fleming Dec. 1983 254 p
(AD-A140011) Avail: NTIS HC A12/MF A01 CSCL 05/5

The Government Accounting Office (GAO) has stated that insufficient attention is given to Human Factors Engineering (HFE) in the design of systems during the Weapons Acquisition Cycle (WAC). According to GAO these inadequacies have adversely impacted our military capabilities and wasted lives and millions of dollars. A myriad of handbooks, manuals and standards exist which provide detailed guidelines, criteria, and test plans for conducting HF T + E (Test and Evaluation) which remain because their technological level is beyond the average user. The need for basic training in HFE has been clearly identified. A cost effective vehicle to bridge this gap in conceptual knowledge has been developed in the form of an HFE Self-Paced Course. The conclusions provided in this study are intended to encourage further course development through incorporation of the recommendations outlined. Ultimately, this would lead to its validation and implementation into the instructional system of the military. GRA

N84-25302# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
FUEL FIRE TESTS OF THE HELICOPTER CREWMAN JACKET Final Report
G. H. Kydd and G. K. Askew 4 Feb. 1983 28 p
(AD-A140037; NADC-83014-60) Avail: NTIS HC A03/MF A01 CSCL 06/17

The Helicopter Crewman Jacket is not only resistant to flames itself, but it adds to whatever other protection the crewman might have creating a generally safer micro-environment. GRA

N84-25303# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
FUEL FIRE TESTS OF POLYTETRA-FLUOROETHYLENE ANTI-EXPOSURE SUITS Final Report
G. H. Kydd and G. K. Askew 28 Feb. 1983 42 p
(AD-A140038; NADC-83008-60) Avail: NTIS HC A03/MF A01 CSCL 06/17

Three anti-exposure suits fabricated of Nomex and PTFE when exposed to a fuel fire of JP-4 for seconds, did not burn, on self-extinguished returning a protective barrier to the potential wearer. GRA

N84-25304# General Electric Co., St. Petersburg, Fla. Metallurgy and Ceramics Lab.
HUMAN FACTORS: A NECESSARY TOOL FOR INDUSTRY
K. O. Starcher Mar. 1984 12 p refs
(Contract DE-AC04-76DP-00656)
(DE84-007531; GEPP-TIS-786) Avail: NTIS HC A02/MF A01

The need for human factors (ergonomics) input in the layout of a ferroelectric ceramics laboratory is presented as an example of the overall need for human factors professionals in industry. However, even in the absence of one trained in human factors, knowledge of a few principles in ergonomics will provide many possibilities for improving performance in the industrial environment. DOE

N84-25253# Joint Publications Research Service, Arlington, Va.
SANITARY AND HYGIENIC FEATURES OF CABIN ENVIRONMENT IN SALYUT-7 ORBITAL STATION
S. N. Zaloguyev, V. P. Savina, L. N. Makhamediyeva, Y. G. Nefedov, A. N. Viktorov, M. A. Vytchikova, and T. V. Batenchuk-Tusko *In its* USSR Rept.: Space Biol. and Aerospace Med., v. 18, no. 2, Mar. - Apr. 1984 (JPRS-USB-84-004) 16 May 1984 p 52-56 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 18, no. 2, Mar. - Apr. 1984 p 40-43 (For primary document see N84-25247 15-51)
Avail: NTIS HC A08

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N84-25305 National Physical Lab., Teddington (England). Div. of Information Technology and Computing.
A SIXTH ANNOTATED BIBLIOGRAPHY OF RECENT PUBLICATIONS ON DATA SECURITY AND CRYPTOGRAPHY
Wyn L. Price Dec. 1983 31 p
(NPL-DITC-35/83; ISSN-2262-5369) Copyright. Avail: Issuing Activity

An annotated bibliography on data security is given. Papers that appeared since the publication of DITC 4/82, together with a few which subsequently came to light are included. R.J.F.

N84-25306*# National Aeronautics and Space Administration. Pasadena Office, Calif.
NANOSEQUENCER DIGITAL LOGIC CONTROLLER Patent Application
Charles R. Lahmeyer, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 9 Mar. 1984 14 p
(Contract NAS7-100)
(NASA-Case-NPO-16116-1; US-Patent-Appl-SN-587749) Avail: NTIS HC A02/MF A01 CSCL 09B

A digital logic controller providing instruction execution times on the order of 50 nanoseconds and employing a read-only memory device is described. A portion of each instruction provides a status-select control signal and address signal for controlling selection of the next instruction from the read-only memory. NASA

N84-25307*# SRI International Corp., Menlo Park, Calif.
INVESTIGATION, DEVELOPMENT, AND EVALUATION OF PERFORMANCE PROVING FOR FAULT-TOLERANT COMPUTERS Final Interim Report
Karl N. Levitt, Richard Schwartz, Dwight Hare, J. S. Moore, P. Michael Melliar-Smith, Robert E. Shostak, Robert S. Boyer, Milton W. Green, and W. David Elliott Aug. 1983 531 p refs
(Contract NAS1-15528; SRI Proj. 7821)
(NASA-CR-166008; NAS 1.26:166008) Avail: NTIS HC A23/MF A01 CSCL 09B

A number of methodologies for verifying systems and computer based tools that assist users in verifying their systems were developed. These tools were applied to verify in part the SIFT ultrareliable aircraft computer. Topics covered included: STP theorem prover; design verification of SIFT; high level language code verification; assembly language level verification; numerical algorithm verification; verification of flight control programs; and verification of hardware logic. For individual titles, see N84-25308 through N84-25324.

N84-25308*# SRI International Corp., Menlo Park, Calif.
STP: A MECHANIZED LOGIC FOR SPECIFICATION AND VERIFICATION Final Report
R. E. Shostak, Richard Schwartz, and P. M. Melliar-Smith *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 11-28 refs (For primary document see N84-25307 15-60)
(Contracts NAS1-15528; F49620-79-C-0099; Grant NSF MCS-79-04081)
Avail: NTIS HC A23/MF A01 CSCL 09B

A logic and proof theory that was mechanized and successfully applied to prove nontrivial properties of a fully distributed fault tolerant system is described. The system is close to achieving the critical balance in man machine interaction necesary for successful application by users other than the system developers. Motivation for the form of man machine interaction embodied by STP is discussed. A formal description of the logic and the proof theory is contained, and the description illustrated with an example. The use of STP in a large scale effort to prove nontrivial properties on SIFT, a distributed Software Implemented Fault Tolerant operating system for aircraft flight control is discussed. Finally, directions for further work are described. Author

N84-25309*# SRI International Corp., Menlo Park, Calif.
SPECIFYING AND VERIFYING ULTRA-RELIABILITY AND FAULT-TOLERANCE PROPERTIES Final Report
Richard L. Schwartz and P. M. Melliar-Smith *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 37-47 refs (For primary document see N84-25307 15-60)
(Contract NAS1-15528)
Avail: NTIS HC A23/MF A01 CSCL 09B

A methodology to rigorously verify ultrareliability and fault tolerance system properties is described. The methodology utilizes a hierarchy of formal mathematical specifications of system design and incremental design proof to prove the system has the desired properties. A small example of the approach is given, and the application of the methodology to the large scale proof of SIFT, a fault tolerant flight control operating system, is discussed. Author

N84-25310*# SRI International Corp., Menlo Park, Calif.
THE HIERARCHICAL SPECIFICATION AND MECHANICAL VERIFICATION OF THE SIFT DESIGN Final Report
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 59-80 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The formal specification and proof methodology employed to demonstrate that the SIFT computer system meets its requirements are described. The hierarchy of design specifications is shown, from very abstract descriptions of system function down to the implementation. The most abstract design specifications are simple and easy to understand, almost all details of the realization were abstracted out, and are used to ensure that the system functions reliably and as intended. A succession of lower level specifications refines these specifications into more detailed, and more complex, views of the system design, culminating in the Pascal implementation. The section describes the rigorous mechanical proof that the abstract specifications are satisfied by the actual implementation. Author

N84-25311*# SRI International Corp., Menlo Park, Calif.
OVERVIEW OF CODE VERIFICATION Final Report **c61**
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 303-304 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The verified code for the SIFT Executive is not the code that executes on the SIFT system as delivered. The running versions of the SIFT Executive contain optimizations and special code relating to the messy interface to the hardware broadcast interface and to packing of data to conserve space in the store of the BDX930 processors. The running code was in fact developed prior to and without consideration of any mechanical verification. This was regarded as necessary experimentation with the SIFT hardware and special purpose Pascal compiler. The Pascal code sections cover: the selection of a schedule from the global executive broadcast, scheduling, dispatching, three way voting, and error reporting actions of the SIFT Executive. Not included in these sections of Pascal code are: the global executive, five way voting, clock synchronization, interactive consistency, low level broadcasting, and program loading, initialization, and schedule construction. Author

N84-25312*# SRI International Corp., Menlo Park, Calif.
A SUMMARY OF HDM Final Report **c61**
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

A brief summary of the Hierarchical Development Methodology (HDM) is provided. The design of a system is decomposed into a hierarchy of abstract machines, linearly ordered with a different abstract machine at each level in the hierarchy. Each abstract machine in the hierarchy is dependent only on the functionality of lower level machines. The facilities of the highest level abstract machine, and only those of that machine, are visible to a user of the system. A machine is itself decomposed into modules, each module having operations and data structures which typically define a single abstract data concept. As in the Parnas module concept, the module is the programming unit of HDM; each of the modules may be independently implemented. The programs implementing a module can access the data structures of their own abstract machine, but not those of lower level machines. Author

N84-25313*# SRI International Corp., Menlo Park, Calif.
AUTOMATIC CONSTRUCTION OF VERIFICATION GENERATORS FROM HOARE LOGICS Final Report **c61**
Mark Moriconi and Richard L. Schwartz *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 333-347 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

A method for mechanically constructing verification condition generators from a useful class of Hoare logics is defined. Any verification condition generator constructed is shown to be sound and deduction complete with respect to the associated Hoare logic. The method was implemented. Author

N84-25314*# SRI International Corp., Menlo Park, Calif.
THE PASCAL-HDM VERIFICATION SYSTEM Final Report **c61**
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 363-373 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The PASCAL-HDM verification system is described. This system

supports the mechanical generation of verification conditions from PASCAL programs and HDM-SPECIAL specifications using the Floyd-Hoare axiomatic method. Tools are provided to parse programs and specifications, check their static semantics, generate verification conditions from Hoare rules, and translate the verification conditions appropriately for proof using the Shostak Theorem Prover, are explained. The differences between standard PASCAL and the language handled by this system are explained. This consists mostly of restrictions to the standard language definition, the only extensions or modifications being the addition of specifications to the code and the change requiring the references to a function of no arguments to have empty parentheses. Author

N84-25315*# SRI International Corp., Menlo Park, Calif.
HDM/PASCAL VERIFICATION SYSTEM USER'S MANUAL Final Report c61
Dwight Hare *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 377-380 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The HDM/Pascal verification system is a tool for proving the correctness of programs written in PASCAL and specified in the Hierarchical Development Methodology (HDM). This document assumes an understanding of PASCAL, HDM, program verification, and the STP system. The steps toward verification which this tool provides are parsing programs and specifications, checking the static semantics, and generating verification conditions. Some support functions are provided such as maintaining a data base, status management, and editing. The system runs under the TOPS-20 and TENEX operating systems and is written in INTERLISP. However, no knowledge is assumed of these operating systems or of INTERLISP. The system requires three executable files, HDMVCG, PARSE, and STP. Optionally, the editor EMACS should be on the system in order for the editor to work. The file HDMVCG is invoked to run the system. The files PARSE and STP are used as lower forks to perform the functions of parsing and proving. Author

N84-25316*# SRI International Corp., Menlo Park, Calif.
THE SIFT CODE SPECIFICATION Final Report c61
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 403-407 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The specification of Software Implemented Fault Tolerance (SIFT) consists of two parts, the specifications of the SIFT models and the specifications of the SIFT PASCAL program which actually implements the SIFT system. The code specifications are the last of a hierarchy of models describing the operation of the SIFT system and are related to the SIFT models as well as the PASCAL program. These Specifications serve to link the SIFT models to the running program. The specifications are very large and detailed and closely follow the form and organization of the PASCAL code. In addition to describing each of the components of the SIFT code, the code specifications describe the assumptions of the upper SIFT models which are required to actually prove that the code will work as specified. These constraints are imposed primarily on the schedule tables. M.A.C.

N84-25317*# SRI International Corp., Menlo Park, Calif.
THE PROOF OF THE SIFT IMPLEMENTATION Final Report c61
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 439-441 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The Software Implemented Fault Tolerance SIFT specifications consist primarily of constraints on the schedule table and descriptions of the changes each routine makes to the global variables. The proof proceeds by proving that each routine is consistent with its specification. Each of these proofs is separate from the others and the order of the proofs is unimportant. A routine is proved by generating a set of verification conditions from the PASCAL code and the SPECIAL specifications. Each verification condition is a set of assertions derived from a particular path in the routine. A verification condition (VC) is generated for each possible path through the routine. M.A.C.

N84-25318*# SRI International Corp., Menlo Park, Calif.
A FORMAL SEMANTICS FOR THE SRI HIERARCHICAL PROGRAM DESIGN METHODOLOGY Final Report c61
Robert S. Boyer and J. S. Moore *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 451-471 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

A formal statement of what it means to use (a subset of) the methodology is presented. It is formally defined that some specified module exists and what it means to say that another module is paid correctly implemented on top of it. No attention is to motivation, either of the methodology or of the formal development of it. Concentration is entirely upon mathematical succinctness and precision. A discussion is presented of how to use certain INTERLISP programs which implement the formal definitions. Among these are a program which generates Floyd like verification conditions sufficient to imply the correctness of a module implementation. M.A.C.

N84-25319*# SRI International Corp., Menlo Park, Calif.
ON WHY IT IS IMPOSSIBLE TO PROVE THAT THE BDX90 DISPATCHER IMPLEMENTS A TIME-SHARING SYSTEM Final Report
Robert S. Boyer and J. S. Moore *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 475-478 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The Software Implemented Fault Tolerance SIFT system, is written in PASCAL except for about a page of machine code. The SIFT system implements a small time sharing system in which PASCAL programs for separate application tasks are executed according to a schedule with real time constraints. The PASCAL language has no provision for handling the notion of an interrupt such as the B930 clock interrupt. The PASCAL language also lacks the notion of running a PASCAL subroutine for a given amount of time, suspending it, saving away the suspension, and later activating the suspension. Machine code was used to overcome these inadequacies of PASCAL. Code which handles clock interrupts and suspends processes is called a dispatcher. The time sharing/virtual machine idea is completely destroyed by the reconfiguration task. After termination of the reconfiguration task, the tasks run by the dispatcher have no relation to those run before reconfiguration. It is impossible to view the dispatcher as a time-sharing system implementing virtual BDX930s running concurrently when one process can wipe out the others. M.A.C.

N84-25320*# SRI International Corp., Menlo Park, Calif.
DEFINING OF THE BDX930 ASSEMBLY LANGUAGE Final Report c61
Robert S. Boyer and J. S. Moore *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 481-505 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

A definition of the BDX930 assembly language is presented. Various definition problems and suggested solutions are included. A class of defined recognizers based on boolean valued nowrecursive functions is employed in preprocessing. M.A.C.

N84-25321*# SRI International Corp., Menlo Park, Calif.
VERIFICATION OF NUMERICAL ALGORITHMS Final Report c61
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 509-518 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The following strategy is suggested for specification and proof: (1) Defer the construction of a formal program specification with respect to I/O assertions unit the correctness of the program with respect to an abstract mathematical model of program intent is demonstrated. (2) Prove that an abstract machine (using infinite precision arithmetic) would compute that object exactly. (3) Prove that the computational sequences of arithmetic operations that occur in the abstract machine must be precisely the same at every step as those occurring on an actual machine (with finite precision arithmetic), executing the same program. (4) Use a Verification Conditions VC-generator that knows about the semantics of arithmetic operations to annotate the program with assertions that bound (or in some circumstances estimate) the difference between the actual machine state variables and the corresponding ones of the abstract machine. Construct the formal program specification by combining the verification conditions into theorems about computational error that can be proved with mechanical assistance. M.A.C.

N84-25322*# SRI International Corp., Menlo Park, Calif.
THE USE OF A FORMAL SIMULATOR TO VERIFY A SIMPLE REAL TIME CONTROL PROGRAM Final Report c61
Robert S. Boyer, Milton W. Green, and J. Strother Moore *In its* Invest., Develop. and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 521-531 refs Previously announced as N84-12745 (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The authors present an initial and elementary investigation of the formal specification and mechanical verification of programs that interact with environments. They describe a mechanical proof that a simple, real time control program keeps a vehicle on a straightline course in a variable crosswind. To formalize the specification they define a mathematical function which models the interaction of the program and its environment. They then state and proved two theorems about this function: the simulated vehicle never gets farther than three units away from the intended course, and it comes to the course if the wind ever remains steady for at least four sampling units. GRA (IAA)

N84-25323*# SRI International Corp., Menlo Park, Calif.
HIERARCHICAL DESIGN AND VERIFICATION FOR VLSI Final Report c61
Robert E. Shostak, W. David Elliott, and Karl N. Levitt *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 535-553 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

The specification and verification work is described in detail, and some of the problems and issues to be resolved in their application to Very Large Scale Integration VLSI systems are examined. The hierarchical design methodologies enable a system architect or design team to decompose a complex design into a formal hierarchy of levels of abstraction. The first step inprogram verification is tree formation. The next step after tree formation is the generation from the trees of the verification conditions themselves. The approach taken here is similar in spirit to the corresponding step in program verification but requires modeling of the semantics of circuit elements rather than program statements. The last step is that of proving the verification conditions using a mechanical theorem-prover. M.A.C.

N84-25324*# SRI International Corp., Menlo Park, Calif.
THREE LECTURES ON THEOREM-PROVING AND PROGRAM VERIFICATION Final Report c61
J. Strother Moore *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 557-588 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

Topics concerning theorem proving and program verification are discussed with particlar emphasis on the Boyer/Moore theorem prover, and approaches to program verification such as the functional and interpreter methods and the inductive assertion approach. A history of the discipline and specific program examples are included. M.A.C.

N84-25325*# Goodyear Aerospace Corp., Akron, Ohio.
MPP DISK SUBSYSTEM Final Report, Oct. 1983 - Mar. 1984
W. A. Hudgins 26 Mar. 1984 55 p refs
(Contract NAS5-27613)
(NASA-CR-175227; NAS 1.26:175227; GER-17234) Avail: NTIS HC A04/MF A01 CSCL 09B

A disk subsystem for the Massively Parallel processor (MPP) is designed to the block diagram level. The subsystem is capable of storing 4,992 megabytes of data, expandable to 39, 936 megabytes. The subsystem is capable of transferring data to the MPP Staging Memory at a rate of 25 megabytes/second, expandable to 100 megabytes/second. A lower cost disk subsystem is also presented. This alternate subsystem is capable of storing 3,744 megabytes with a transfer rate of 10.6 megabyte/second. M.A.C.

N84-25326# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
[ACTIVITIES REPORT OF THE LABORATORY FOR COMPUTER SCIENCE (FOA 32)] Annual Report, 1983
Feb. 1984 44 p refs
(FOA-C-30356-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Inst. of National Defence, Stockholm, KR 50

A brief summary of the activities in computer science of the Laboratory for Computer Science (FOA 32) is presented. The research was mainly directed towards various aspects of image processing, numerical analysis, computer science, and geographic information systems. Applications discussed include remote sensing, aerosol size distribution, and satellite orbits. R.J.F.

N84-25327# California Inst. of Tech., Pasadena. Dept. of Computer Science.
SUBMICRON SYSTEMS ARCHITECTURE Semiannual Technical Report
Apr. 1983 32 p
(Contract N00014-79-C-0597; ARPA Order 3771)
(AD-A139844; Rept-5078-TR-83) Avail: NTIS HC A03/MF A01 CSCL 09/2

This document reports the research activities and results for the period 16 October 1982 to 15 April 1982 under the Defense Advanced Research Project Agency (ARPA) Submicron Systems Architecture Project. The central theme of this research is the architecture and design of VLSI systems appropriate to a microcircuit technology scaled to submicron feature sizes, and includes related efforts in concurrent computation and VLSI design. The scope of the research is discussed in greater detail in our previous technical report (5052:TR:82). GRA

N84-25328# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
CRONUS: A DISTRIBUTED OPERATING SYSTEM Interim Technical Report, Jul. - Dec. 1982
R. Schantz, B. Woznick, G. Bono, E. Burke, and S. Geyer Griffiss AFB, N.Y. RADC Dec. 1983 255 p
(Contract F30602-81-C-0132; AF Proj. 2530)
(AD-A139983; BBN-5261; RADC-TR-83-255; ITR-2) Avail: NTIS HC A12/MF A01 CSCL 09/2

This report contains the preliminary system/subsystem specification for the Cronus Distributed Operating System. It also reports progress in the development of the underlying support system components, the measurement of local network performance, and the structuring of system messages. The object of this project is to define, design, implement and test an advanced development model for a distributed operating system. The DOS controls the interactions among collections of computers interconnected via high speed local area network technology. The overall function of the DOS is to integrate the various data processing subsystems into a coherent, responsive and reliable system. The system is to include the following functions: system monitoring, reliability and survivability, access control and authentication, and a uniform

command language. In addition, the system is to provide support for the following system services: uniform file system, electronic mail message distribution, data translation, and interactive access to remote programs. GRA

N84-25329# Naval Postgraduate School, Monterey, Calif.
A GUIDE TO MACRO AND MICRO COMPUTER PERFORMANCE EVALUATION M.S. Thesis
G. K. Gray Dec. 1983 125 p
(AD-A140127) Avail: NTIS HC A06/MF A01 CSCL 09/2

Guidelines and discussions are presented for computer performance evaluation at two levels. The first level, Computer Performance Management (CPM) or Macro Performance Evaluation, involves an overall computer performance management strategy concerning the use of computer resources. The role of CPM throughout the computer system life-cycle is also discussed. The second level of computer performance involves Computer Performance Evaluation (CPE) or Micro Performance Evaluation. A brief discussion of CPE tools is given, as well as how to select a performance monitor. Some computer performance fallacies are revealed and a discussion of the determination of 'critical sections' of software systems and program tuning practices for improving system performance is presented. Limited discussion is devoted to performance issues in relatively new areas in the computer field such as networks, data base management systems and microcomputers. Author (GRA)

N84-25330# Fermi National Accelerator Lab., Batavia, Ill.
THE FUTURE OF COMPUTING TECHNOLOGY IN PHYSICS: THE POTENTIALS AND PITFALLS
A. E. Brenner Feb. 1984 21 p refs Presented at the Ann. Joint APS/AAPT Meeting, San Antonio, Tex., 2 Feb. 1984
(Contract DE-AC02-76CH-03000)
(DE84-007249; FERMILAB-Conf-84/27; CONF-840260-1) Avail: NTIS HC A02/MF A01

The impact of the developments of modern digital computers is discussed, especially with respect to physics research in the future. The effects of large data processing capability and increasing rates at which data can be acquired and processed are considered. DOE

N84-25331# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
COMPUTER SCIENCE AND TECHNOLOGY: SELECTION OF MICROCOMPUTER SYSTEMS Final Report
J. Barkley, D. Gilbert, and A. Hankinson Mar. 1984 34 p refs
(PB84-167725; NBS-SP-500-112; LC-84-601010) Avail: NTIS HC A03/MF A01 CSCL 09B

This document is chiefly aimed at providing assistance to non-technical users in evaluating the applicability of microcomputer-based systems in addressing their needs and choosing appropriate systems. However, technical users providing related support to their organizations should also find the material useful. Similarity, while focused for Federal users of administrative/management applications, there is general applicability to other environments. GRA

N84-24607# Raytheon Co., Sudbury, Mass. Equipment Div.
FAULT TOLERANT SPACEBORNE COMPUTER
Davis R. Bates, Jr., James E. Schell (Army Communications-Electronics Command, Fort Monmouth, N.J.), and G. Robert Couranz *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 14 p (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-25332 Defence Research Information Centre, Orpington (England).
MATHEMATICAL MODEL OF POWER STATION BLOCKS WITH FORCED CIRCULATION STEAM GENERATION
W. Hofmeister and A. Kantner Dec. 1983 75 p refs Transl. into ENGLISH from Siemens AG (Karlsruhe, West Germany), Rept. KFK-PDV-103, Jan. 1977
(DRIC-T-7008; BR90580; KFK-PDV-103) Copyright. Avail: Issuing Activity

As a first step to derive a nonlinear total model for a power station an exact model of a steam superbeater was made. The linear model is only partly suitable for the simulation of a power station controlled by a process computer. Models are described which are suitable for fossil and for nuclear heated power station control (acceptance test operating test), synthesis of power station control (safe, rapid operation, representative control rests), and production of favorable steam generation structures. Author

N84-25333 Royal Signals and Radar Establishment, Christchurch (England).
AN ALGORITHM FOR THE ESTIMATION OF LIMITING RECOGNITION RANGE OF IMAGE INTENSIFIER SYSTEMS
D. E. Vaughan Jan. 1971 29 p refs
(SRDE-7100; BR26152) Copyright. Avail: Issuing activity

The importance of contrast loss through the atmosphere as a factor limiting the range performance of image intensifier systems has been discussed in an earlier report. The methods of calculation used to provide the numerical data contained in the earlier report have been extended in this report to produce an algorithm which, when entered with values of basic optical parameters of the image intensifier system together with values of target contrast at zero range and visual range, will display in graphical form the variation of limiting recognition range with illumination level. This report will be concerned with the basic assumptions and limitations of the algorithms and their effects upon its application. The details of the computer programs will not be discussed but guidance concerning their use is given. B.W.

N84-25334*# Intermetrics, Inc., Huntsville, Ala.
PDSS/IMC QUALIFICATION TEST USER'S MANUAL
1 Mar. 1984 102 p 2 Vol.
(Contract NAS8-33825)
(NASA-CR-171025; NAS 1.26:171025; IR-AL-020) Avail: NTIS HC A06/MF A01 CSCL 09B

User interfaces are defined for qualification test set up, run time commands, run time displays, and shutdown of the image motion compensator. A.R.H.

N84-25335*# Intermetrics, Inc., Huntsville, Ala.
PDSS/IMC QUALIFICATION TEST SOFTWARE ACCEPTANCE PROCEDURES
26 Apr. 1984 43 p 2 Vol.
(Contract NAS8-33825)
(NASA-CR-171026; NAS 1.26:171026; IR-AL-026) Avail: NTIS HC A03/MF A01 CSCL 09B

Tests to be performed for qualifying the payload development support system image motion compensator (IMC) are identified. The performance of these tests will verify the IMC interfaces and thereby verify the qualification test software. A.R.H.

N84-25336*# California Univ., Los Angeles.
DATAFLOW COMPUTING APPROACH IN HIGH-SPEED DIGITAL SIMULATION Final Report, 15 Dec. 1980 - 14 Dec. 1982
Milos D. Ercegovac and Walter J. Karplus Jun. 1984 5 p refs
(Grant NAG3-132)
(NASA-CR-173552; NAS 1.26:173552) Avail: NTIS HC A02/MF A01 CSCL 09B

New computational tools and methodologies for the digital simulation of continuous systems were explored. Programmability, and cost effective performance in multiprocessor organizations for real time simulation was investigated. Approach is based on functional style languages and data flow computing principles,

which allow for the natural representation of parallelism in algorithms and provides a suitable basis for the design of cost effective high performance distributed systems. The objectives of this research are to: (1) perform comparative evaluation of several existing data flow languages and develop an experimental data flow language suitable for real time simulation using multiprocessor systems; (2) investigate the main issues that arise in the architecture and organization of data flow multiprocessors for real time simulation; and (3) develop and apply performance evaluation models in typical applications. E.A.K.

N84-25337# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.

INTERACTIVE CREATION OF INSTRUCTIONS FOR INTERACTIVE GRAPHIC ANALYSIS (INGA)

Ingolf Grieger, Guenter Wagemann, and Guangmao Wu 1983 26 p refs

(ISD-300; ISSN-0170-6071) Avail: NTIS HC A03/MF A01

The aim of the development of the interactive programing (Interactive Graphis Analysis) is to perform computer aided structural analysis (auxillary finite element techniques such as pre-. medio- and postprocessing). In the design of the INGA system the modular concept was used written in FORTRAN. The program is hardware-independent and currently implemented on Control Data, DEC, IBM, Prime and UNIVAC computers with calligraphic (directed beam), raster and storage displays. The system is so flexible that extensions and alterations are introduced without difficulties. There is a collection of graphics subroutines available named GASIC INGA. These subroutines are used for the development of new application functions which are then integrated into the INGA system in the EXTRA part for all additional user defined operations. Interactive work often implies the repretition of sequences of commands with sometimes slightly different parameters. The proparation of some typical sequences of commands is a useful help for an interactive menu-driven program. B.G.

N84-25338# Ecole Nationale Superieure des Telecommunications, Paris (France). Dept. Informatique.

ENGINEERING PROGRAMMING AT THE ECOLE NATIONALE SUPERIEURE DES TELECOMMUNICATIONS (ENST): PARTICULARITIES AND TENDENCIES [GENIE LOGICIEL A L'E.N.S.T.: PARTICULARITES ET TENDANCES]

Jean-Alain Hernandez and Christine Nora Dec. 1983 10 p ref In FRENCH Presented at AFCET Journees d'Etudes: Apprendre le Genie Logiciel, Paris, 19-20 Dec. 1983

(ENST-C-83004; ISSN-0751-1337) Avail: NTIS HC A02/MF A01

The development of engineering software at the Ecole Nationale Superieure des Telecommunications (ENST) is discussed. The production methods, based on the life cycle of the computer systems program, are introduced to improve the quality of problem analysis and programming. The involvement of the students in the development of the program is examined. Transl. By M.A.C.

N84-25339# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.

COMPRESSION AND DECOMPRESSION OF IMAGING SENSOR SIGNALS (CADISS): AN IMAGE (DE)COMPRESSION SYSTEM FOR DEEP SPACE APPLICATION

H. F. A. Roefs May 1983 9 p refs Presented at 4th Symp. on Inform. Theory in the Benelux, Leuven, Belgium, 26 - 27 May 1983

(Contracts ESTEC-5047/82/NL-HP; NTVR-1987)

(NLR-MP-83028-U) Avail: NTIS HC A02/MF A01

A breadboard model of an image compression/decompression system for use on board scientific satellites is presented. The system consists of a microprogrammable, high speed, 16 bit, image data (de)compressor with a parallel processor architecture. Only complementary metal oxide semiconductors (CMOS) are incorporated into the computer system design. The processor was designed to achieve a high degree of programmability while operating at low power consumption levels. Three well performing algorithms are available for the system, one for entropy coding and two for data compression with a fixed reconstruction error. Application of the data compression system hardware to space environment conditions is considered. R.S.F.

N84-25340# Research Inst. of National Defence, Stockholm (Sweden).

A COMPUTER PROGRAM FOR MAPPING REGIONS IN A GEOGRAPHIC DATA BASE WITH RASTER STRUCTURE

Jan Tjernberg and Anders Wellving Jan. 1984 31 p refs In SWEDISH; ENGLISH summary

(FOA-C-20529-D8; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

SCOPE is a computer program that can be used for the creation of regions or landscape types in a satellite image. It uses a scanning window for a series of filtering processes and the result is a map which shows a few different regions together with existing lakes. An application of the program which is shown in the report is the study of the relation between forested and open land in an area but as a general tool for mapping out regions in geographic data bases with raster structure, the program has a large variety of applications. Author

N84-25341# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.

PROGRAMS FOR HANDLING RASTER CHAIN (RC) CODED IMAGES

Tomas Lindgren Dec. 1983 45 p refs

(FOA-C-30351-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Inst. of National Defence, Stockholm KR 50

Binary images can be encoded by using chain codes. Three programs are described for coding and decoding images using the entity raster chain (RC) code. Creating segments, creating objects, storage structure, and object hierarchy are discussed. Coding objects, generating the border of an object, and generating whole objects from RC code are explained. A.R.H.

N84-25342# Research Inst. of National Defence, Umea (Sweden). Dept. 4.

INTERACTIVE COMPUTER PROGRAM VISION 4 (VISUAL INFORMATION SYSTEM INTERACTIVE ONLINE FOR FOA 4) FOR PLOTTING AND DATA ANALYSIS

Bo Einarsson Nov. 1983 26 p refs In SWEDISH; ENGLISH summary

(FOA-C-40182-A3,B2,C2; ISSN-0347-2124) Avail: NTIS HC A03/MF A01; Research Inst. of National Defence, Stockholm KR 50

An interactive program, VISION4 (Visual Information System Interactive Online for FOA 40, for analyzing data of the form y = f(t) is described. When the program VISION4 is run, the user answers the questions asked by the program. The input file is supposed to consist of N sets of values of T and Y stored in single precision by the statement WRITE() T, Y. In the present version N < = 1001. The data may be either formatted (in which case list directed input is being used), or not. Smoothing is included using Chebyshev polynomials. A special feature of the program is the possibility to reduce the data values with a power of the independent variable or an exponential function of the independent variable. The program SPLOT, using splines instead of Chebyshev polynomials, is documented. R.J.F.

N84-25343# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.

REAL-TIME SIMULATION IN A TERRAIN MODEL: MATHEMATICAL DESCRIPTION

Kenth Carlsson Jan. 1984 47 p refs In SWEDISH; ENGLISH summary

(FOA-C-56041-H2; ISSN-0347-7665) Avail: NTIS HC A03/MF A01

The mathematical setting for a simulator, intended to be used for simulated firing with light antitank weapons, is described. The main part of the simulator is a model of an authentic terrain section. A turntable assembly serves as a platform for a light antitank weapon. For pointing at the surface of the model and to simulate

a projectile impact, a laser pointer is used. A mobile target can be moved on the terrain surface in any arbitrary direction. A computer, a VAX 11/780, controls the simulator and carries out all the calculations during a simulation. In this basic mathematical description the ballistic functions of the light antitank weapon Carl Gustav m/48 are used. Naturally, any light antitank weapon with documented ballistics can be simulated. B.W.

N84-25344# Oxford Univ. (England). Dept. of Engineering Science.
A COMPUTER PACKAGE FOR DESIGNING pH REGULATION SYSTEMS
O. L. R. Jacobs and W. A. Badran 1983 35 p Sponsored by the Science and Engineering Research Council
Avail: NTIS HC A03/MF A01

Three related preprints about computer aided design (CAD) of pH systems are discussed. Why problems of pH regulation are interesting, but difficult is explained. An introduction to the need for the CAD package described is given. The CAD package which simulates pH regulation in a common class of unit process is described. A selection of conventional and novel algorithms performing classical control, adaptive control and online estimation is included. The simulation is sufficiently accurate in detail and well provided with interactive features that it can be used to design real plant. Examples are given to show how it was applied in two different ways: to design controllers for existing plant and to explore control aspects of proposed new plant. A user's guide to the CAD package is given. R.J.F.

N84-25345# Oxford Univ. (England). Dept. of Engineering Science.
AN IMPLEMENTATION OF WATSON'S ALGORITHM FOR COMPUTING 2-DIMENSIONAL DELAUNAY TRIANGULATIONS
S. W. Sloan and G. T. Houlsby 1983 26 p refs
(QUEL-1509/83; SM045/83) Avail: NTIS HC A03/MF A01

A FORTRAN 77 implementation of Watson's algorithm for computing 2-dimensional Delaunay triangulations is described. The algorithms is shown to have an asymptotic time complexity bound which is better than O(N(1.5)) by applying it to collections of N points generated randomly within the unit square. The computer code obeys strict FORTRAN 77 syntax. Excluding the memory needed to store the coordinates of the points, it requires slightly greater than 9N integer words of memory to assemble and store the Delaunay triangulation. R.J.F.

N84-25346# Research Inst. of National Defence, Linkoeping (Sweden).
COMPUTER PROGRAM FOR TREATING AND COMPILING IONOSPHERIC DATA
Lars Baecklund Feb. 1984 40 p In SWEDISH; ENGLISH summary
(FOA-C-30354-E; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Inst. of National Defence, Sweden, Stockholm KR 50

The computer program MEDGEN is described. The MEDGEN program treats and compiles data from the ionospheric observatories at Uppsala, Lycksele and Kiruna to the monthly report IONOSPHERIC DATA SWEDEN. A description of the test programs which test indata to MEDGEN are included. M.A.C.

N84-25347# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
DATA EXCHANGE AND TRANSFER STRUCTURES [STRUCTURS D'EXCHANGE ET DE TRANSFERT]
J. C. Roussel and D. Claude 23 Feb. 1984 23 p Presented at CAM 1 Conf., Brussels, 6 Jul. 1983 and AECMA Conf., Munich, 26 - 27 Sep. 1983
(SNIAS-832-111-103) Avail: NTIS HC A02/MF A01

Communication between all CAD/CAM systems involved; storage of data in a centralized bank; control of CAD/CAM development; upward compatibility; competition between vendors; and short term available are discussed. B.G.

N84-25348# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Aircraft Div.
SOLID MODELING AT SNIAS
F. Pasquier 23 Feb. 1984 24 p Presented at AECMA CAD/CAM Working Group Conf., Munich, Sep. 1983
(SNIAS-832-111-106) Avail: NTIS HC A02/MF A01

Interactive design and process of complex shapes with the use of CAD/CAM were studied. Focus was on the acquisition of development of a geometric modeler. B.G.

N84-25349# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Aircraft Div.
SNIAS'S EXPERIENCE AND WORK IN THE GEOMETRIC MODELING AREA
F. Pasquier 23 Feb. 1984 15 p Presented at CAM-1 2nd Geometric Modeling Seminar, Cambridge, England, 12 - 14 Dec. 1983
(SNIAS-832-111-107) Avail: NTIS HC A02/MF A01

SIGMA is a CAD/CAM system for complex shape design with integrated modules to process these shapes: drawing on GERBER and BENSON machines; mesh for aerodynamics and finite element analysis; and N/C machining. The need for a modelling tool for mechanical parts and assemblies appeared, to enhance the capabilities of SIGMA. This modelling tool must be able to manage a complete model of parts and assemblies containing: the entire geometry; the process of conception; and non geometric properties (density, color, links with other parts). The geometric modeller, as part of the CAD/CAM environment, must communicate easily with SIGMA (on CDC and VAX); with the drawing systems CADDS 3 (CV) and CD 2000 (CDC); with the mesh processor UNISTRUC; with the N/G machining software SIGMA, CADDS 3, CADDS, CDC 300; and with the centralized data bank (on CDC). Author

N84-25350# Arcon Corp., Waltham, Mass.
MATHEMATICAL MODELLING OF WAVEGUIDING TECHNIQUES AND ELECTRON TRANSPORT, VOLUME 2 Final Technical Report, 1 Feb. 1978 - 30 Sep. 1982
S. Woolf and P. P. Wintersteiner Griffiss AFB, N.Y. RADC Jan. 1984 420 p
(Contract F19628-78-C-0188; AF Proj. 2306)
(AD-A139604; RADC-TR-83-313-Vol-2) Avail: NTIS HC A18/MF A01 CSCL 09/2

This report describes techniques and computer programs developed to analyze various problems. The scope of this work extended into three technical areas: (1) the study of dielectric waveguide modes and arrays of dielectric waveguides; (2) the study of a mechanism for producing diffraction gratings in crystals exhibiting photorefractivity; and (3) the problem of electron scattering and transport in solids. Author (GRA)

N84-25351# System Development Corp., San Diego, Calif.
INGRES TO dBASE AND FINANCIAL SPREADSHEET PROGRAM PACKAGES
J. Baird Feb. 1984 111 p
(Contract N66001-83-D-0094)
(AD-A139626; NOSC-CR-223) Avail: NTIS HC A06/MF A01 CSCL 09/2

The ingresdbase command provides support for exchanging user database files between two popular relational database management systems. Ingres and dBASE II databases may be related to or from their respective internal formats into a form suitable for transporting over standard ASCII data communication links. The command includes sufficient information to automatically re-create the database on the other machine with only modest user involvement. Author (GRA)

N84-25352# Universal Energy Systems, Inc., Dayton, Ohio.
PANASONIC HR-1800 HAND-HELD COMPUTER SOLUTIONS TO COMPOSITE MATERIALS FORMULAS Final Report, Sep. 1982 - Jun. 1983
T. N. Massard and W. J. Park Wright-Patterson AFB, Ohio AFWAL Sep. 1983 27 p
(Contract F33615-82-C-5001; AF Proj. 2307)

(AD-A139798; AFWAL-TR-83-4093) Avail: NTIS HC A03/MF A01 CSCL 09/2

This volume contains the description and instructions of the use of Panasonic HR-1800 Hand-Held Computer for the key calculations of the stiffness and strength of symmetric laminated composites. Instant calculations can be made for practical use. GRA

N84-25353# Desmatics, Inc., State College, Pa.
RESEARCH ON FACTOR SCREENING IN COMPUTER SIMULATION Final Technical Report
C. A. Mauro and D. E. Smith Mar. 1984 17 p
(Contract N00014-79-C-0650)
(AD-A139825; TR-113-15) Avail: NTIS HC A02/MF A01 CSCL 12/1

The object of this research program has been to evaluate and compare the performance of factor screening procedures for use in computer simulation experiments. Factor screening methods are statistical methods that attempt to identify, efficiently and economically, the set of most important factors. Once the most important factors have been identified, further simulation (or real-world) experimentation can focus on these particular factors. This eliminates experimentation with relatively unimportant factors, which can needlessly consume resources. This report briefly discusses the problem background, summarizes the research goals, and provides a reference list of all technical reports, journal publications, and presentations prepared under this contract. GRA

N84-25354# Mitre Corp., Bedford, Mass.
SOFTWARE COST ESTIMATION WORKSHOP REPORT Final Report
H. Schultz Jan. 1984 39 p Workshop held at Bedford, Mass., 13 - 15 Sep. 1983
(Contract F19628-84-C-0001; AF Proj. 6810)
(AD-A139840; MTR-9165; ESD-TR-84-150) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Software Cost Estimation (SCE) Workshop was held September 13-15, 1983 at The MITRE Corporation in Bedford, Mass., sponsored by the Electronic Systems Division of the U.S. Air Force and the Rome Air Development Center, Rome, N.Y. Government and industry experts addressed the topics: Cost Effective Software Data Collection on Defense Programs; Integrating SCE with Program Management; Organization and Performance of SCE; and New Directions in SCE. This report contains a summary of each group's discussions and findings, together with a list of recommendations. The views expressed at the workshop and reported in this document are those of the participants and should not be interpreted as official positions of the government agencies, corporate entities, academic institutions or other organizations with which the individual participants are affiliated. GRA

N84-25355# University of Southern California, Marina del Rey. Information Sciences Inst.
AUTOMATING THE TRANSFORMATIONAL DEVELOPMENT OF SOFTWARE, VOLUME 1
S. F. Fickas Mar. 1983 198 p
(Grant NSF MCS-79-18792)
(AD-A139860; ISI/RR-83-108-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 09/2

This report proposes a new model of software development by transformation. It provides a formal basis for automating and documenting the software development process. The current manual transformation model has two major problems: long sequences of low level transformations are required to move from formal specification to implementation, and the problem solving used to reach an implementation is not recorded. Left implicit (and undocumented) are the goals and methods that lead to transformation applications, and the criteria used to select one transformation over another. The new model, as incorporated in a system called Glitter, explicitly represents transformation goals, methods, and selection criteria. Glitter achieves a user supplied goal by carrying out the problem solving required to generate an appropriate sequence of transformation applications. For example, the user asks Glitter to eliminate a data structure that would be expensive to store or a function costly to compute. Glitter achieves this by locating all references to the offending construct and devising an appropriate substitution for each. Glitter was able to automatically generate 90% of the planning and transformation steps in the examples studied. This report is published in two volumes. Volume 1 contains the text of the report; Volume 2 is a set of seven appendices relating to and illustrating the text in Volume 1. GRA

N84-25356# University of Southern California, Marina del Rey. Information Sciences Inst.
AUTOMATING THE TRANSFORMATIONAL DEVELOPMENT OF SOFTWARE. VOLUME 2: APPENDICES
S. F. Fickas Mar. 1983 279 p
(Grant NSF MCS-79-18792)
(AD-A139918; ISI/RR-83-109) Avail: NTIS HC A13/MF A01 CSCL 09/2

This report proposes a new model of software development by transformation. It provides a formal basis for automating and documenting the software development process. The current manual transformation model has two major problems: (1) long sequences of low-level transformations are required to move from formal specification to implementation, and (2) the problem-solving used to reach an implementation is not recorded. Left implicit (and undocumented) are the goals and methods that lead to transformation applications, and the criteria used to select one transformation over another. The new model, as incorporated in a system called Glitter, explicitly represents transformation goals, methods, and selection criteria. Glitter achieves a user-supplied goal by carrying out the problem-solving required to generated an appropriate sequence of transformation applications. For example, the user asks Glitter to eliminate a data structure that would be expensive to store or a function costly to compute. Glitter achieves this by locating all references to the offending construct and devising an appropriate substitution for each. Glitter was able to automatically generated 90 percent of the planning and transformation steps in the examples studied. This report is published in two volumes. Volume 1 contains the text of the report: Volume 2 is a set of seven appendices relating to and illustrating the text in Volume 1. Author (GRA)

N84-25357# Naval Postgraduate School, Monterey, Calif.
A KNOWLEDGE-BASED SYSTEM FOR LP (LINEAR PROGRAMMING) MODELING
D. R. Dolk 10 Jan. 1983 27 p
(RR0-0001)
(AD-A139991; NPS54-83-012) Avail: NTIS HC A03/MF A01 CSCL 12/1

The focus of this paper is on linear programming (LP) software in the context of model management and decision support. As a result, we will not be interested in the algorithmic properties of LP or math programming (MP) codes, but rather their applicability to more generalized modeling environments wherein models can be linked or decomposed in a manner which frees the user from having to know the internal representation which the algorithms require. In particular, we will look at the objectives and functions of a generalized model management system and how these require a knowledge-based modeling capability. We will then describe a partial implementation of a knowledge-based modeling system for LP models called the Generalized experimental Math Programming system (GXMP). GRA

N84-25358# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
FUNDAMENTAL DESIGN PROBLEMS OF DISTRIBUTED SYSTEMS FOR THE HARD REAL-TIME ENVIRONMENT Ph.D. Thesis
A. K. L. Mok Jan. 1984 186 p
(Contract N00014-75-C-0661)
(AD-A139996; MIT/LCS/TR-297) Avail: NTIS HC A09/MF A01 CSCL 09/2

Software designed to function in a hard-real-time environment

where strict timing constraints must be met often entails implicit assumptions about a programming language and the underlying system which supports it. Programs which are logically correct, i.e., they implement the intended algorithms, may not function correctly if their assumed timing characteristics are not met. This can occur if the programming language is not expressive enough to permit an adequate specification of the desired timing characteristics of the software if the expressible timing characteristics cannot be verified before run time. For distributed systems in particular, the software must be tailored to a myriad of implementation parameters, e.g., communication bandwidth, thus rendering subsequent modifications hazardous. Our research investigates the basic problems in automating the design and maintenance of hard real-time software. After examining the limitations of the traditional approach to real-time software design via process-based models, we shall provide a graph-based computation model which is more suitable for expressing the computational requirements of the hard real-time environment. This model is an extension of CONSORT (Control Structure Optimized for Real-Time), an experimental software design system which has been implemented to generate process control application programs from block diagram schemata. While our graph-based model, the complexity of the relevant resource allocation problems for meeting stringent timing constraints is investigated. Author (GRA)

N84-25359# Naval Postgraduate School, Monterey, Calif.
APL (A PROGRAMMING LANGUAGE) TUTOR: AN ON-LINE INSTRUCTIONAL FACILITY M.S. Thesis
K. A. Lanes Dec. 1983 201 p
(AD-A140117) Avail: NTIS HC A10/MF A01 CSCL 05/9

This thesis describes a set of APL programs which enable a student to learn A Programming Language (APL) by using it. The student needs to know only how to log on to the computer and enter a few simple commands to begin the course. The basic unit of the TUTOR workspace is the text variable which describes the use of one of seventy-five built-in APL functions. This description is accessible by a HELP function without going through an entire lesson. Other functions conduct interactive question-and-answer drill. A MENU function lists the units for student selection of a lesson or information on a symbol. The student can also go through a sequence of lessons in a computer-driven course. These programs were written on and for the IBM 3033 installation at Naval Postgraduate School, using APL version 4.0 for VM/CMS with IBM 3278 terminals. Author (GRA)

N84-25360# California Univ., Berkeley. Lawrence Berkeley Lab.
GRAPHIC DESIGN OF PROGRAM TEXT
Aaron Marcus and Ronald Baecker (Human Computing Resources Corp.) May 1982 11 p refs Presented at the Graphics Interface Conf., Toronto, 17-21 May 1982
(Contract DE-AC03-76SF-00098)
(DE84-008162; LBL-14810; CONF-820530-2) Avail: NTIS HC A02/MF A01

Computer programs, like literature, deserve attention not only to conceptual and verbal (linguistic) structure but also to visual structure, i.e., the qualities of alphanumeric text fonts and other graphic symbols, the spatial arrangement of isolated texts and symbols, the temporal sequencing of individual parts of the program, and the use of color (including gray values). With the increasing numbers of programs of ever greater complexity, and with the widespread availability of high resolution raster displays, both soft copy and hard copy, it is essential and possible to enhance significantly the graphic design of program test. Relevant principles from information-oriented graphic design, especially book design are summarized. It is shown how a standard C program might be translated into a well-designed typographic version. The intention is to acquaint the computer graphics community with the available and relevant concepts, literature, and expertise, and to demonstrate the great potential for the graphic design of computer programs. DOE

N84-25361# Sandia Labs., Albuquerque, N. Mex.
ADAPTIVE COHERENCE ESTIMATION
Samuel D. Stearns and Otis M. Solomon, Jr. 1984 5 p refs Presented at the Intern. Symp. on Circuits and Systems - ISCAS, Montreal, Canada, 7 May 1984
(Contract DE-AC04-76DP-00789)
(DE84-006486; SAND-84-0317C; CONF-840576-15) Avail: NTIS HC A02/MF A01

The process of adaptive coherence estimation, in which adaptive filters are used to obtain the coherence estimate under nonstationary as well as stationary signal conditions, is discussed. A scalar function called the total coherence is introduced and used to illustrate some of the properties and errors in adaptive coherence estimation, particularly the bias error. DOE

N84-25362# Oak Ridge National Lab., Tenn. Dept. of Computer Sciences.
FLOCHT: A SYSTEM OF FORTRAN CODES FOR COMPUTER DRAWN FLOW CHARTS AND DIAGRAMS
M. L. Ballou and S. K. Fischer Feb. 1984 72 p
(Contract W-7405-eng-26)
(DE84-007569; ORNL/CSD/TM-61/R1) Avail: NTIS HC A04/MF A01

FLOCHT is a package of FORTRAN IV programs which use the DISSPLA graphics package to draw flow charts and diagrams on a variety of plotting devices. The software is comprised of interactive programs designed to run on the PDP-10 and batch programs to run on the IBM 3033 or 370/195. The interactive programs prompt the user to input instructions which describe the flow chart being drawn. The instructions are written on disk to be used by one of the batch programs. Use of FLOCHT requires a minimum of knowledge of the computer system and no understanding of FORTRAN or programming. Familiarity with a text editor is helpful. Commands and information on executing FLOCHT are given. FLOCHT uses version 8.2 of the DISSPLA graphics package. DOE

N84-25363# National Aerospace Lab., Amsterdam (Netherlands). Informatics Div.
INTRODUCTION TO COMPUTER-AIDED DESIGN/COMPUTER-AIDED MANUFACTURING
F. J. Heerema 8 Apr. 1983 33 p refs In DUTCH; ENGLISH summary Presented at NVvL Symp. on the Importance of CAD/CAM to the Dutch Aircraft Engr., Delft, 6 May 1983
(NLR-MP-83018-U) Avail: NTIS HC A03/MF A01

In aerospace industry, increasing use is made of CAD/CAM. CAD/CAM may be viewed as the application of computers in the various phases of an industrial product, from concept, via design and production, upto operations. Important components for CAD/CAM systems are: interactive use of computers, combined with graphic input and output; data management facilities for storage and control of information; linking computers by means of data-communication networks, to support data transfer between processes and disciplines. In this Introduction to CAD/CAM, the various terms are explained shortly. Some attention will be paid to development abroad. Author

N84-25364# Arizona Univ., Tucson.
RESEARCH ON NEW, FAST, DIRECT-EXECUTING PROGRAMS FOR MULTIPLE MICROPROCESSOR SYSTEMS
G. A. Korn Apr. 1983 51 p refs
(Grant NSF ECS-79-25404)
(PB84-162791; NSF/ECS-83021) Avail: NTIS HC A04/MF A01 CSCL 09B

The MICRODARE/LABNET System, which is a minicomputer language for laboratory automation and control, is discussed. MICRODARE executes directly on a typed RUN command and runs at approximately one-half assembly language speed. In addition, MICRODARE/LABNET includes speed. In addition, MICRODARE/LABNET includes communications primitives to permit one minicomputer to program and control multiple concurrent real-time tasks in several other processors connected by serial links. MICRODARE programs are shown for a small computer which reads an analog voltage 100 times per second, performs a low-pass filtering operation with the transfer function, and sets

the output into a digital-to-analog converter. A variety of signal-processing and random-processing-measurement applications are illustrated, including periodic signal enhancement by recursive averaging, fast Fourier transform, and peak reading. GRA

N84-25365# National Bureau of Standards, Boulder, Colo. National Engineering Lab.
NONLINEAR LEAST SQUARES REGRESSION USING STARPAC: THE STANDARDS TIME SERIES AND REGRESSION PACKAGE
J. R. Donaldson and P. V. Tyon Oct. 1983 64 p refs
(PB84-166214; NBS-TN-1068-2) Avail: NTIS HC A04/MF A01 CSCL 12A

The Standards Time Series and Regression Package (STARPAC) is a library of FORTRAN subroutines for statistical data analysis. STARPAC emphasizes the statistical interpretation of results, and, for this reason, comprehensive printed reports of auxiliary statistical information, often in graphical form, are automatically provided to augment the basic statistical computations performed by each user-callable STARPAC subroutine. STARPAC thus provides the best features of many standalone statistical software programs within the flexible environment of a subroutine library. Sixteen subroutines for nonlinear least squares regression are documented. Twelve of these compute the least squares estimates, performing either weighted or unweighted analysis with either numerically approximated or user-supplied (analytic) derivatives. The other four are user-callable subroutines for two procedures used within the estimation code: the first selects optimum step sizes for approximating the partial derivatives of the model; and the second checks the validity of a user-supplied derivative subroutine. GRA

N84-24626# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
VERIFICATION AND VALIDATION TECHNIQUES APPLIED TO THE RECONFIGURABLE BLOCK SD SATELLITE SOFTWARE
William C. Diniak *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 12 p refs (For primary document see N84-24603 15-12)
(Contracts F04701-74-C-0020; F04701-78-C-0018)
Avail: NTIS HC A15/MF A01

N84-24871# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
A DESIGNER'S PERCEPTION OF COMPUTER-AIDED DESIGN Abstract Only
Warren P. Seering *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 67 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCI 09/2

N84-24873# George Washington Univ., Washington, D.C.
KINSYN AND MICRO KINSYN: USER-FRIENDLY COMPUTER SYSTEMS FOR LINKAGE DESIGN Abstract Only
Roger E. Kaufman and Murali Raju Dandu (Kintech, Inc.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 70-71 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 09/2

N84-25149# Royal Inst. of Tech., Stockholm (Sweden).
DESIGN OF INTERACTIVE GRAPHICS FOR DIGITAL ELEVATION MODEL (DEM) SAMPLING
Anders Oestman *In its* Photogrammetric Res. 1983 11 p refs (For primary document see N84-25146 15-43)
Avail: NTIS HC A10/MF A01

N84-25311*# SRI International Corp., Menlo Park, Calif.
OVERVIEW OF CODE VERIFICATION Final Report
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 303-304 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25312*# SRI International Corp., Menlo Park, Calif.
A SUMMARY OF HDM Final Report
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25313*# SRI International Corp., Menlo Park, Calif.
AUTOMATIC CONSTRUCTION OF VERIFICATION GENERATORS FROM HOARE LOGICS Final Report
Mark Moriconi and Richard L. Schwartz *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 333-347 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25314*# SRI International Corp., Menlo Park, Calif.
THE PASCAL-HDM VERIFICATION SYSTEM Final Report
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 363-373 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25315*# SRI International Corp., Menlo Park, Calif.
HDM/PASCAL VERIFICATION SYSTEM USER'S MANUAL Final Report
Dwight Hare *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 377-380 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25316*# SRI International Corp., Menlo Park, Calif.
THE SIFT CODE SPECIFICATION Final Report
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 403-407 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25317*# SRI International Corp., Menlo Park, Calif.
THE PROOF OF THE SIFT IMPLEMENTATION Final Report
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 439-441 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25318*# SRI International Corp., Menlo Park, Calif.
A FORMAL SEMANTICS FOR THE SRI HIERARCHICAL PROGRAM DESIGN METHODOLOGY Final Report
Robert S. Boyer and J. S. Moore *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 451-471 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25320*# SRI International Corp., Menlo Park, Calif.
DEFINING OF THE BDX930 ASSEMBLY LANGUAGE Final Report
Robert S. Boyer and J. S. Moore *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 481-505 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25321*# SRI International Corp., Menlo Park, Calif.
VERIFICATION OF NUMERICAL ALGORITHMS Final Report
In its Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 509-518 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25322*# SRI International Corp., Menlo Park, Calif.
THE USE OF A FORMAL SIMULATOR TO VERIFY A SIMPLE REAL TIME CONTROL PROGRAM Final Report
Robert S. Boyer, Milton W. Green, and J. Strother Moore *In its* Invest., Develop. and Evaluation of Performance Proving for

Fault-Tolerant Computers Aug. 1983 p 521-531 refs Previously announced as N84-12745 (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25323*# SRI International Corp., Menlo Park, Calif.
HIERARCHICAL DESIGN AND VERIFICATION FOR VLSI Final Report
Robert E. Shostak, W. David Elliott, and Karl N. Levitt *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 535-553 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25324*# SRI International Corp., Menlo Park, Calif.
THREE LECTURES ON THEOREM-PROVING AND PROGRAM VERIFICATION Final Report
J. Strother Moore *In its* Invest., Develop., and Evaluation of Performance Proving for Fault-Tolerant Computers Aug. 1983 p 557-588 refs (For primary document see N84-25307 15-60)
Avail: NTIS HC A23/MF A01 CSCL 09B

N84-25554# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
A COMPUTER PROGRAM FOR CALCULATING NON-LTE MODEL STELLAR ATMOSPHERES
Ivan Hubeny *In its* Stellar Spectra and Their Interpretation 1981 p 32-35 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25555# Warsaw Univ. Observatory (Poland).
MODEL STELLAR ATMOSPHERE AND SPECTRUM COMPUTATIONS WITH MINICOMPUTER
Jerzy Madej *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 36-38 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25556# Purkyne Univ., Brno (Czechoslovakia). Nicolaus Copernicus Observatory and Planetarium.
COMPUTER PROGRAMS FOR PROCESSING OF SPECTRA Abstract Only
Zdenek Pokorny *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 39-40 (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N84-25366*# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
DEVELOPMENT AND EVALUATION OF A FAULT-TOLERANT MULTIPROCESSOR (FTMP) COMPUTER. VOLUME 4: FTMP EXECUTIVE SUMMARY
T. Basil Smith, III and Jaynarayan H. Lala Feb. 1984 53 p refs (Contract NAS1-15336)
(NASA-CR-172286; NAS 1.26:172286; R-1603) Avail: NTIS HC A04/MF A01 CSCL 03B

The FTMP architecture is a high reliability computer concept modeled after a homogeneous multiprocessor architecture. Elements of the FTMP are operated in tight synchronism with one another and hardware fault-detection and fault-masking is provided which is transparent to the software. Operating system design and user software design is thus greatly simplified. Performance of the FTMP is also comparable to that of a simplex equivalent due to the efficiency of fault handling hardware. The FTMP project constructed an engineering module of the FTMP, programmed the machine and extensively tested the architecture through fault injection and other stress testing. This testing confirmed the soundness of the FTMP concepts. B.W.

N84-25367# California Univ., Livermore. Lawrence Livermore Lab.
SPECIAL OR GENERAL PURPOSE END-TO-END TRANSPORT MECHANISMS IN DISTRIBUTED SYSTEMS: ONE VIEW
R. W. Watson and S. Mamrak (Ohio State Univ.) Feb. 1984 13 p refs Presented at the 4th Intern. Conf. on Distributed Computing Systems, San Francisco, 14-18 May 1984
(Contract W-7405-eng-48)
(DE84-008297; UCRL-89755; CONF-8405126-1) Avail: NTIS HC A02/MF A01

There is increasing interest in the design of special purpose end to end transport mechanisms for use in distributed systems. The special purpose designs try to minimize the mechanisms needed to match the error and other service properties of specific networks with the services required by application and communication interface semantics. General-purpose transport protocol designs and implementations can be effective in a wide range of distributed applications because: (1) many of the mechanisms and implementation techniques used in the special purpose work apply to general purpose transport protocol designs and implementations; (2) special purpose designs have hidden costs; and (3) quite special overall system loads, application response times, and interaction patterns are required before general purpose protocols are the main performance bottlenecks. M.A.C.

N84-25368*# California Univ., Livermore. Lawrence Livermore Lab.
REQUIREMENTS FOR MIGRATION OF NSSD CODE SYSTEMS FROM LTSS TO NLTSS
M. Pratt 22 Feb. 1984 33 p refs
(Contract W-7405-eng-48)
(DE84-009533; UCID-30198) Avail: NTIS HC A03/MF A01

The purpose of this document is to address the requirements necessary for a successful conversion of the Nuclear Design (ND) application code systems to the NLTSS environment. The ND application code system community can be characterized as large-scale scientific computation carried out on supercomputers. NLTSS is a distributed operating system being developed at LLNL to replace the LTSS system currently in use. The implications of change are examined including a description of the computational environment and users in ND. The discussion then turns to requirements, first in a general way, followed by specific requirements, including a proposal for managing the transition. DOE

N84-25369# California Univ., Livermore. Lawrence Livermore Lab.
DISPLAY UNITS FOR ONLINE PASSAGE RETRIEVAL: A COMPARATIVE ANALYSIS
T. R. Girill Sep. 1983 24 p refs Presented at the 31st Intern. Tech. Communication Conf., Seattle, 1 May 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE84-001004; UCRL-89740; CONF-840560-1) Avail: NTIS HC A02/MF A01

Several commercial and governmental computer services now let users retrieve passages online from the full text of books, statutes, or journal articles. The display units in which the test is packaged, however, vary greatly between systems, and these units heavily influence the quality of service. Four reader problems concerning printed books - finding where subjects are discussed, assessing how important each treatment is, linking scattered treatments of the same subject, and exploiting the text's organization - all have standard solutions involving widespread, time tested indexing strategies. All four problems reappear in computerized passage retrieval systems. But, in each case, structural display units (those based on format) prove much less successful then functional display units (based on content) in permitting the traditional solutions to work online too. Hence, functional units consistently support better access to online information than do structural units. DOE

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N84-25370# Stanford Univ., Calif. Dept. of Computer Science.
THE ADVANTAGES OF ABSTRACT CONTROL KNOWLEDGE IN EXPERT SYSTEM DESIGN
W. J. Clancey Nov. 1983 21 p Presented at the Natl. Conf. on Artificial Intelligence, 1983
(Contract N00014-79-C-0302)
(AD-A139978; SU-STAN-CS-83-995; HPP-83-17; SU-TR-7) Avail: NTIS HC A02/MF A01 CSCL 06/4

A poorly designed knowledge base can be as cryptic as an arbitrary program and just as difficult to maintain. Representing control knowledge abstractly, separately from domain facts and relations, makes the design more transparent and explainable. A body of abstract control knowledge provides a generic framework for constructing knowledge bases for related problems in other domains and also provides a useful starting point for studying the nature of strategies. Author (GRA)

N84-25371# Stanford Univ., Calif. Dept. of Computer Science.
STRATEGIC EXPLANATIONS FOR A DIAGNOSTIC CONSULTATION SYSTEM
D. W. Hasling, W. J. Clancey, and G. Rennels Nov. 1983 32 p
(Contract N00014-79-C-0302)
(AD-A140014; SU-STAN-CS-83-996; HPP-MEMO-83-41) Avail: NTIS HC A03/MF A01 CSCL 06/4

This paper examines the problem of automatic explanation of reasoning, especially as it relates to expert systems. By explanation we mean the ability of a program to discuss what it is doing in some understandable way. We first present a general framework in which to view explanation and review some of the research done in this area. We then focus on the explanation system for NEOMYCIN, a medical consultation program. A consultation program interactively helps a user to solve a problem. Our goal is to have NEOMYCIN explain its problem-solving strategies. An explanation of strategy describes the plan the program is using to reach a solution. Such an explanation is usually concrete, referring to aspects of the current problem situation. Abstract explanations articulate a general principle, which can be applied in different situations; such explanations are useful in teaching and in explaining by analogy. We describe the aspects of NEOMYCIN that make abstract strategic explanations possible-the representation of strategic knowledge explicitly and separately from domain knowledge--and demonstrate how this representation can be used to generate explanations. Author (GRA)

N84-25372# Argonne National Lab., Ill. Mathematics and Computer Science Div.
PORTABLE ENVIRONMENT FOR RESEARCH IN AUTOMATED REASONING
Ewing L. Lusk and Ross A. Overbeek 1984 10 p refs Presented at the 7th Ann. Conf. on Automated Deduction, Napa, Calif., 14 May 1984
(Contract W-31-109-eng-38)
(DE84-009212; CONF-8405128-1) Avail: NTIS HC A02/MF A01

The Interactive Theorem Prover (ITP), an environment that supports research into the theory and application of automated reasoning, is described. The ITP is an interactive system providing convenient access to, and control of, the many inference mechanisms of logic Machine Architecture (LMA). The LMA substantially enhanced since the last report on its status. Some of the enhancements, particularly the addition of a tightly coupled logic programming component are described. The logic programming component provides an integration of the theorem proving and logic programming approaches to problems represented in the predicate calculus. DOE

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-25373 Royal Signals and Radar Establishment, Malvern (England).
IMPLEMENTATION OF THE SIGN-LOGARITHM ARITHMETIC FFT
S. J. Kidd Nov. 1983 47 p refs
(AD-A139355; RSRE-Memo-3644; BR90772) Copyright. Avail: Issuing Activity

The simulation studies described show that sign-logarithm arithmetic can be implemented in a practical digital FFT analyzer. Sign logarithm arithmetic allows a smaller wordlength than conventional fixed point arithmetic while maintaining performance. Discussion of the hardware implementation of such a sign-logarithm FFT shows that power consumption can be less than conventional methods using bipolar multipliers. The use of a smaller wordlength allows a significant simplification of the sytem into which the FFT analyzer is placed and a higher data throughput rate. B.W.

N84-25374# Suomalainen Tiedeakatemia, Helsinki (Finland).
ON 4TH-ORDER HOMOGENEOUS FUNCTIONALS IN THE CLASS OF BOUNDED UNIVALENT FUNCTIONS Thesis
Pertti Lehto 1984 50 p refs
Avail: NTIS HC A03/MF A01

Some extremal problems for bounded univalent functions are considered. Among the most important methods developed for solving these problems are Loewner's approximation method, Shiffner's variational method, and the Grunsky inequality. B.G.

N84-25375# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Abt. Automatisierung.
LINEAR ASSOCIATIVE MAPPINGS
Klaus Arbter Nov. 1983 27 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-856)
(DFVLR-FB-84-01; ESA-TT-856) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 11,50

Dealing with incomplete or strongly disturbed information by use of backdated experiences is typical for intelligence. As T. Kohonen (1979) showed, there exists a linear mapping with comparable qualities for discrete signal vectors. Proceeding from a geometrical interpretation of this idea, memory and time sharing realizations are derived in this work. Some aspects, concerning the application of linear associative mapping for image processing, are discussed. Author

N84-25376# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
A STUDY OF THE DIFFERENT SOLUTION METHODS FOR NONLINEAR PROBLEMS
Zhu Runxiang and H. Parisch 1982 30 p refs
(ISD-304; ISSN-0170-6071) Avail: NTIS HC A03/MF A01

Efficient algorithms are always important when solving nonlinear mechanical problems with the finite element method. The combination of the arc-length method with line search and various Newton-type procedures are introduced. This method is ideally suited for tracing the nonlinear response from the pre-limit to the post-limit range and also improves the solution quality. The earlier work is reviewed and then the combination of the methods is studied, and incorporated into an existing computer program. Four examples involving the geometric nonlinear static analysis of shells show that the combination of the methods can be recommended. Author

N84-25377# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik der Luft- und Raumfahrtkonstruktionen.
GAUSSIAN QUADRATURE FORMULAE FOR TETRAHEDRONAL REGIONS
Yu Jinyun 1982 13 p refs

(ISD-307; ISSN-0170-6071) Avail: NTIS HC A02/MF A01

Quadrature formulas of degree two to six are presented for the numerical integration of a function over tetrahedronal regions. The formulas are of Gaussian type and are fully symmetric with respect to the four vertices of the tetrahedron. Several numerical examples were used to test the accuracy of these formulas. Author

N84-25378# Bonn Univ. (West Germany). Sonderforschungbereich 72.

ON THE OPTIMAL APPROXIMATION RATES FOR CRISS-CROSS FINITE ELEMENT SPACES

Wolfgang Dahmen (Bielefeld Univ.) and Charles A. Micchelli (IBM) Oct. 1983 38 p refs Sponsored by Deutschen Forschunggemeinschaft

(Preprint-622) Avail: NTIS HC A03/MF A01

Let delta denote the triangulation of the plane obtained by multiinteger translates of the four lines x = 0, y = 0, x = y and x = -y. By S(supra mu, sub k,h) the space of all piecewise polynomials of degree < or = to k with respect to the scaled triangulation h? having continuous partial derivatives of order < or = to mu on R(2) is meant. The approximation properties of S(supra mu, sub k,h) are completely governed by those of the space spanned by the translates of all so called box splines contained in S(supra mu, sub k,h). Combining this fact with Fourier analysis techniques allows to determine the optimal controlled approximation rates for the above subspace of box splines where mu is the largest degree of smoothness for which these spaces are dense as h tends to zero. Furthermore, the question of local linear dependence of the translates of the box splines for the above criss-cross triangulations was studied. Author

N84-25379# National Aerospace Lab., Amsterdam (Netherlands). Space Flight Div.

A GENERALIZED CLASS OF CERTAINTY AND INFORMATION MEASURES

J. C. A. Vanderlubbe, Y. Boxma, and D. E. Boekee 7 Jan. 1982 39 p refs Sponsored by Delft University Fund

(NLR-MP-82038-U) Avail: NTIS HC A03/MF A01

Unlike the usual definition of measures of information in terms of the relation between information and uncertainty, a different approach in which the relation between certainty and information plays a central role is presented. Information measures are introduced with the help of certainty measures within this framework. This approach leads to three generalized classes of information measures, and unifies the known measures of information into one generalized probabilistic theory of discrete information measures. Author

N84-25380# Research Inst. of National Defence, Linkoeping (Sweden).

GEOMETRICAL TRANSFORMATION OF BINARY IMAGES

Maris Linge and Ronny Strandberg Dec. 1983 70 p refs In SWEDISH; ENGLISH summary

(FOA-C-30342-E1; ISSN-0347-3708) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm KR 50

Some methods for geometrical transformation of binary images have been investigated. Special care has been taken to introduce as little distortion as possible when for example enlarging a slant edge. A Program for experimenting with several of these methods has been written. The report contains a description of the implemented methods and a discussion of the results obtained. Two classes of methods have been used. In the first, the contour following method, the contours are extracted and the transformations are applied to these. The second class of methods is a generalization of bilinear approximation. It may also be viewed upon as an extension of shrinking and expansion. It is shown that these kinds of methods give good quality. The contour following methods used did not give a very high quality. Author

N84-25381# Societe Nationale Industrielle Aerospatiale, Cannes (France). Computer Science Dept.

THE FRONT CONCEPT AND PROFILE REDUCTION NUMBERINGS

L. Marro 1984 41 p refs

(SNIAS-832-440-102) Avail: NTIS HC A03/MF A01

Profile reduction methods are intended for time and storage reduction in solving linear systems of equation Mx = b using direct methods. An unified theoretical framework for profile reduction problems based on graph theory concepts is presented. The numbering front is defined as the set of unnumbered vertices adjacent to at least one numbered vertex. The storage requirement and the number of operations needed for the Gauss decomposition by envelope method depends on the numbering front evolution. Using these results, lower bounds for profile and number of operations for envelope method applied to graphs satisfying an isoperimetric unequality are given. By the same means a lower bound with respect to the diameter of the graph for well known profile reduction algorithms is obtained. Author

N84-25382# Arcon Corp., Waltham, Mass.

MATHEMATICAL MODELLING OF WAVEGUIDING TECHNIQUES AND ELECTRON TRANSPORT, VOLUME 1 Final Technical Report, 1 Feb. 1978 - 30 Sep. 1982

S. Woolf and P. P. Wintersteiner Griffiss AFB, N.Y. RADC Jan. 1984 276 p

(Contract F19628-78-C-0188; AF Proj. 2306)

(AD-A139603; RADC-TR-83-313-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 12/1

This report describes techniques and computer programs developed to analyze various problems. The scope of this work extended into three technical areas: (1) the study of dielectric waveguide modes and arrays of dielectric waveguides; (2) the study of a mechanism for producing diffraction gratings in crystals exhibiting photorefractivity; and (3) the problem of electron scattering and transport in solids. Author (GRA)

N84-25383# North Carolina Univ., Chapel Hill. Operations Research and Systems Analysis.

ESTIMATING NETWORK RELIABILITY WITH ACCELERATED CONVERGENCE RATES ON ERROR BOUNDS

G. S. Fishman Dec. 1983 38 p

(Contract N00014-76-C-0302)

(AD-A139841; UNC-ORSA-TR-83/7) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this paper is to describe related estimation techniques that improve the convergence rate to 1/K when a specified nonrandom finite sequence of sample points is used and to (log K)/K when certain nonrandom infinite sequences of sample points are used. In addition, algorithms are given for computing estimates of g(s,t) with 1/K and (log K)/K convergence rates with computation time complexities per replication having an upper bound O(N) + O(max(N,/V/)) as K approaches limit of infinity. Although the infinite sequences have a slower convergence rate than the finite sequence has, these offer the convenience of allowing one to add replications as desired and retaining the rate. By contrast, the finite sequence does not allow this addition, once K is initially fixed. GRA

N84-25384# Maryland Univ., College Park. Center for Automation Research.

EMBEDDING OF NETWORKS OF PROCESSORS INTO HYPERCUBES

A. Y. Wu Dec. 1983 24 p

(Contract F49620-83-C-0082; AF Proj. 2304)

(AD-A139847; CAR-TR-36; CS-TR-1354; AFOSR-84-0175TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

In the study of parallel computing, networks of processors are often organized into various configurations such as trees, pyramids, and mesh arrays. These configurations can be represented as graphs. Using the properties and structures of the underlying graph effectively, the computation and communication speeds can often be improved. The hypercube is a good host graph for the embedding of networks of processors because of its low degree and low diameter. Graphs such as trees and arrays can be

embedded into a hypercube with small dilation and expansion costs, but there are classes of graphs which can be embedded into a hypercube only with large expansion cost or large dilation cost. GRA

N84-25385# Maryland Univ., College Park. Center for Automation Research.
A PARALLEL METHOD FOR NATURAL TEXTURE SYNTHESIS
S. Ma and A. Gagalowicz Nov. 1983 16 p
(Contract F49620-83-C-0082; AF Proj. 2304)
(AD-A139889; CAR-TR-32; CS-TR-1343; AFOSR-84-0181TR)
Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper deals with an optimization technique applied to natural texture synthesis. It proposes a definition of a global criterion which is the mean square error between the statistical features of a natural original texture and those of an artificially generated one. A gradient algorithm is used to minimize this criterion. The statistical feature vector used was the autocorrelation function although this is by no means the only choice. The textures generated are very similar to the original ones. This method can be implemented in a highly parallel manner. Author (GRA)

N84-25386# Maryland Univ., College Park. Center for Automation Research.
ON MAPPING HOMOGENEOUS GRAPHS ON A LINEAR ARRAY-PROCESSOR MODEL
I. V. Ramakrishnan, D. S. Fussell, and A. Silberschatz Oct. 1983 46 p
(Contract F49620-83-C-0082; AF Proj. 2304)
(AD-A139912; CAR-TR-30; CS-TR-1339; AFOSR-84-0180TR)
Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents a formal model of linear array processors suitable for VLSI implementation as well as graph representation of programs suitable for execution on such a model. A distinction is made between correct mapping and correct execution of such graphs on this model and the structure of correctly mappable graphs are examined. The formalism developed is used to synthesize algorithms for this model. Author (GRA)

N84-25387# Naval Weapons Center, China Lake, Calif.
NUMERICAL SOLUTION OF ALGEBRAIC MATRIX RICCATI EQUATIONS Final Report
W. F. Arnold, III Feb. 1984 163 p
(AD-A139929; AD-E900331; NWC-TP-6521) Avail: NTIS HC A08/MF A01 CSCL 12/1

Numerical issues related to the computational solution of the algebraic matrix Riccati equation are studied. The approach uses the generalized eigenproblem formulation for the solution of general forms of applications. These general forms result from control and filtering problems for systems in generalized (or implicit or descriptor) state space form. A Newton-type iterative refinement procedure for the generalized Riccati solution is derived. The issue of numerical condition of the Riccati problem is addressed. Balancing to improve numerical condition is discussed. An overview of a software package coded in FORTRAN is given. Results of numerical experiments are reported. GRA

N84-25388# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
ON THE SEQUENTIAL NATURE OF UNIFICATION Interim Research Report
C. Dwork, P. C. Kanellakis, and J. C. Mitchell Mar. 1984 24 p
(Contract N00014-83-K-0146; Grant NSF MCS-82-10830)
(AD-A139939; MIT/LCS/TM-257) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of unification of terms is log-space complete for P. In deriving this lower bound no use is made of the potentially concise representation of terms by directed acyclic graphs. In addition, the problem remains complete even if infinite substitutions are allowed. A consequence of this result is that parallelism cannot significantly improve on the best sequential solutions for unification. The dual problem of computing the congruence closure of an equivalence relation is also log-space complete for P. However, it is shown that for the problem of term matching, an important subcase of unification, there is a good parallel algorithm using O(log 2 n) time and nO(1) processors on a PRAM. For the O(log2 n) parallel time upper bound it is assumed that the terms are represented by directed acyclic graphs; if the longer string representation is used an O(log n) parallel time bound is obtained. Author (GRA)

N84-25389# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EXPECTED ENERGY METHOD FOR ELECTRO-OPTICAL SNR CALCULATIONS
G. J. Mayer 2 Feb. 1984 42 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A139984; TR-634; ESD-TR-83-245) Avail: NTIS HC A03/MF A01 CSCL 12/1

A mathematically robust method is derived that allows the signal to noise ratio (SNR) of an electro-optical system to be estimated when a point source image falls onto a sensor array of discrete picture elements (pixel). The derivation is based on a geometrical analysis of image and sensor element configuration. This method allows the optimal pixel size to be selected to maximize the expected SNR for any point source image once it's diameter is known. In this report the method is used to determine the probability of an image falling into one, two, ..., six pixels as a function of image diameter and pixel size, and the corresponding expected maximum signal. Examples are given using this method to estimate the SNR for an electro-optical system. Author (GRA)

N84-25390# Systems Research Labs., Inc., Dayton, Ohio.
TWO-DIMENSIONAL FAST FOURIER TRANSFORMS IN IMAGE PROCESSING Interim Report, 1982 - 1983
D. E. Lewis Jan. 1984 76 p
(Contract F33615-82-C-0511; AF Proj. 7184)
(AD-A139997; AFAMRL-TR-84-006) Avail: NTIS HC A05/MF A01 CSCL 12/1

This report is intended to orient the reader to the application of the discrete two-dimensional (fast) Fourier transform in the context of digital image processing. Both mathematical and pictorial results (magnitude, phase, and power spectral density plots) are presented for a variety of rudimentary and more complex images. In addition, the VIPER (Visual Image Processing, Enhancement, and Reconstruction) digital image processing facility of the Air Force Aerospace Medical Research Laboratory is described. Author (GRA)

N84-25391# Stanford Univ., Calif. Dept. of Statistics.
SWITCHING NET MODELS: RUDIMENTARY BEHAVIOR, REPRESENTATIONS AND APPLICATIONS
A. E. Gelfand 4 Apr. 1984 43 p
(Contract N00014-76-C-0475)
(AD-A140047; TR-343) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is the purpose of this report to introduce the reader to a class of abstract models called switching net models. Such models are quite simple in conception but nonetheless offer considerable behavioral diversity and complexity. In this sense they become quite attractive models for examination. The former aspect allows them significant receptivity to mathematical analysis and to computer simulation which the latter enables their applicability in the general systems sense to a variety of problems. The authors describe the fundamentals of switching net behavior, offer several different representations of switching nets and describe three appealing applications of these models. GRA

N84-25392# California Univ., Berkeley. Center for Pure and Applied Mathematics.
CONTRIBUTIONS TO THE COMPUTATION OF THE MATRIX EXPONENTIAL, REVISION
K. C. Ng Feb. 1984 82 p
(Contract N00014-76-C-0013)
(AD-A140069; PAM-212) Avail: NTIS HC A05/MF A01 CSCL 12/1

This thesis consists of two parts. First, a condition number for

the exponential of a triangular matrix S is introduced. It measures how sensitive is e sub s to relatively small perturbations in the elements of S. Second, a new technique (matrix argument reduction) for computing periodic matrix functions is described and discussed in detail. By applying this technique to the computation of e sub s one can always reduce the problem to one in which the eigenvalues lie close to the real axis. GRA

N84-25393*# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
COMMENTS ON BOUNDED ERROR ADAPTIVE CONTROL
D. Orlicki, L. Valavani, and M. Athans Jan. 1984 9 p Revision
(Grant NGL-22-009-124; Contract N00014-82-K-0582; Grant NSF ECS-82-10960)
(NASA-CR-173542; NAS 1.26:173542; AD-A140096) Avail: NTIS HC A02/MF A01 CSCL 12A

The purpose of this note is to discuss the model matching performance of the adaptive control algorithm suggested by Peterson and Narenda. Author (GRA)

N84-25394# California Univ., Berkeley. Center for Pure and Applied Mathematics.
BANDED PRECONDITIONING FOR THE SOLUTION OF SYMMETRIC POSITIVE DEFINITE LINEAR SYSTEMS
B. Nour-Omid and H. D. Simon Oct. 1983 18 p
(Contract N00014-76-C-0013)
(AD-A140097; CPAM-185) Avail: NTIS HC A02/MF A01 CSCL 12/1

The preconditioned conjugate gradient algorithm has been successfully applied to solving symmetric linear systems of equations arising from finite difference and finite element discitizations of a variety of problems. In this paper the authors consider a matrix splitting A = M + R, where M is a part of A chosen such that its factorization has little or no fill-in. They develop a simple criterion to check for the positive definiteness of M. It turns out that a large class of matrices, including matrices arising from finite element discretization of elliptic boundary value problems, satisfy this criterion. Presented are some numerical tests where M is used as a preconditioning matrix for the conjugate gradient algorithm. Examples include problems arising from structural engineering. A comparison with the preconditioning based on an incomplete Choleski factorization is encouraging. GRA

N84-25395# Florida Univ., Gainesville. Dept. of Physics.
SUPERSYMMETRY IN PHYSICS: AN ALGEBRAIC OVERVIEW
P. Ramond 1983 38 p refs Presented at the Workshop on Supersymmetry in Phys., Los Alamos, N. Mex., Dec. 1983
(Contract DE-AS05-81ER-40008)
(DE84-007289; DOE/ER-40008/56; CONF-831267-2) Avail: NTIS HC A03/MF A01

Graded Lie algebras (GLA) are used in nonrelativistic physics as approximate symmetries of Hamiltonians. The most striking use so far helps compare even and odd nuclei energy levels. Evidence suggests that graded Lie algebras can be used whenever paired and unpaired fermions excitations can coexist. Finite graded Lie algebras and their representations were used in this overview of a tremendously large field. For nonrelativistic applications, all of GLA are potentially useful, while for relativistic applications, only those which include the Poincare group should be considered. DOE

N84-25396# California Univ., Livermore. Lawrence Livermore Lab.
MOLAG: A METHOD OF LINES ADAPTIVE GRID INTERFACE FOR NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS
Niel K. Madsen Jul. 1983 32 p refs Presented at the IFIP PDE Software Conf., Soderkoping, Sweden, 22-26 Aug. 1983
(Contract W-7405-eng-48)
(DE84-009161; UCRL-89636; CONF-830873-3) Avail: NTIS HC A03/MF A01

An adaptive grid or moving node method is described which can be used to solve systems of nonlinear partial differential equations. The method is implemented in the form of a method of lines software interface. When this interface is combined with a reliable ordinary differential equation solver, one obtains the capability to adaptively solve systems of partial differential equations. Numerical results are presented. DOE

N84-25397# Oak Ridge National Lab., Tenn. Health and Safety Research Div.
CONVERSATIONAL EIGENANALYSIS PROGRAM FOR SOLVING DIFFERENTIAL EQUATIONS
George G. Killough and Keith F. Eckerman 1984 11 p refs Presented at the 17th Midyear Topical Meeting of the Health Phys. Soc., Pasco, Wash., 5 Feb. 1984
(Contract W-7405-eng-26)
(DE84-007560; CONF-840202-21) Avail: NTIS HC A02/MF A01

Dynamic models that arise in health physics applications are often expressed in terms of systems of ordinary differential equations. In many cases, such as box models that describe material exchange among reservoirs, the differential equations are linear with constant coefficients, and the analysis can be reduced to the examination of solutions of initial-value problems for such systems. A conversational code, DIFSOL, is described that permits the user to specify the coefficient matrix and an initial vector of the system; DIFSOL prints out closed-form solutions and tables of the solution, its derivative, and its integral for any specified linear combination of state variables. The program logic permits menu-driven control. DOE

N84-25398# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany).
THE NUMERICAL TREATMENT OF LINEAR INTEGRODIFFERENTIAL EQUATIONS Thesis - Freie University
Wolfgang Volk Aug. 1982 77 p refs In GERMAN; ENGLISH summary
(HMI-B-381; D/M-136) Avail: NTIS HC A05/MF A01

A method for the approximate solution of linear operator equations of the second kind is developed. A procedure for solving linear ordinary integrodifferential equations is presented. An iteration process acting with a sequence of contractions is outlined. Criteria for the control and termination of the process are developed using the approximate method. Author (ESA)

N84-25399# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany). Bereich Datenverarbeitung und Elektronik.
SPECIAL METHODS FOR SPLINE FUNCTIONS ASSOCIATED TO UNIFORM GRIDS
Wolfgang Volk Aug. 1982 53 p refs In GERMAN; ENGLISH summary
(HMI-B-381; D/M-137) Avail: NTIS HC A04/MF A01

Simplifications for numerical algorithms treating spline functions associated with uniform grids are presented to aid computer programming. Evaluation of B-splines and its application to interpolation; computation of inner products of B-splines; prolongation of splines if the grid is refined; and computation of upper bounds for several norms of splines are treated. The methods used for the first and the third problem are applied to tensor product splines. Numerical examples of the fourth problem are given. Author (ESA)

N84-25547# Warsaw Univ. Observatory (Poland).
ANALYSIS OF MgII LINES IN ALGOL
Henryk Cugier *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 17-20 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25408# Middle East Technical Univ., Ankara (Turkey). Dept. of Mathematics.
LOWER AND UPPER BOUNDS FOR EXP d+(X,Y)
Bahattin Cengiz *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 115-123 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

N84-25416# Cukurova Univ., Adana (Turkey). Dept. of Mathematics.
PIECEWISE MONOTONE INTERPOLATION AND APPROXIMATION WITH GENERALIZED POLYNOMIALS
Sermin Atacik *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 243-252 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-25400# Syracuse Research Corp., N. Y. School of Computer and Information Science.
[PROPERTIES OF A NEW RANK STATISTIC FOR COMPARING TWO POPULATIONS IN AN ARBITRARY RIGHT CENSORING SAMPLING SCHEME] Final Interim Report, 16 May 1982 - 15 May 1983
K. G. Mehrotra Jun. 1983 15 p
(Grant AF-AFOSR-0146-82; AF Proj. 2304)
(AD-A139640; AFOSR-84-0177TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The properties of a new rank statistic for comparing two populations in an arbitrary right censoring sampling scheme were investigated. The new statistic is an extension of the locally most powerful rank statistic for uncensored data and an extension of the well-known Wilcoxon statistic. The power of the new statistic was compared with the Prentice statistic for a sample size of IO and the new statistic was generally of slightly higher power for the logistic alternatives investigated. The investigators are optimistic that the statistic will remain more powerful against other alternatives. Author (GRA)

N84-25401# Stanford Univ., Calif. Dept. of Statistics.
APPROXIMATIONS FOR EXPECTED VALUES OF NORMAL ORDER STATISTICS WITH AN APPLICATION TO GOODNESS-OF-FIT
N. Fotopoulos, J. Leslie, and M. Stephens 6 Mar. 1984 33 p
(Contract N00014-76-C-0475)
(AD-A139970; SU-TR-342) Avail: NTIS HC A03/MF A01 CSCL 12/1

This article considers new approximations for expected values of standard normal order statistics, and uses these to give asymptotic theory for the Shapiro-Francia statistic for a test of normality. Author (GRA)

N84-25402# Oak Ridge National Lab., Tenn. Mathematics and Statistics Research Dept.
UPDATING LU FACTORIZATIONS FOR COMPUTING STATIONARY DISTRIBUTIONS
R. E. Funderlic and R. J. Plemmons (North Carolina State Univ., Raleigh) Feb. 1984 34 p refs
(Contract W-7405-eng-26)
(DE84-007566; ORNL/CSD-TM-208) Avail: NTIS HC A03/MF A01

The computation of stationary probability distributions for Markov chains is important in the analysis of many models in the mathematical sciences, such as queueing network models, input-output economic models and compartmental tracer analysis models. These computations often involve the solution of large-scale homogeneous linear equations by Gaussian a/sub ij less than or equal to 0 for all i = j and has zero column sums. The stationary distributions are the components of the unique solution vector x of positive components whose sum is one. Stable direct methods for computing x by triangular factorization A = LU have received considerable attention recently and the purpose of this paper is to provide a stable method for updating the factors L and U in 0 n(2) flops in the case where a column of A is modified. Updating formulas are derived here using an approach definite matrix after the addition of a rank one matrix. The algorithm is effective more generally for any matrix that has a stable LU factorization and for which the updated matrix has a stable LU factorization. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-25403# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
INTERACTIVE DECISION ANALYSIS AND MODELLING
T. J. Stewart, ed. Jan. 1983 269 p refs Presented at the NRIMS Summer Seminar Series, Pretoria, 7-9 Feb. 1983
(CSIR-TWISK-294) Avail: NTIS HC A12/MF A01

The lectures fall into two categories. The first category surveys the field of multiple criteria decision making and developments therein. The second category deals more with computer interaction in the design, construction and implementation of decision support models. M.A.C.

N84-24874# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
DYNAMIC STABILITY OF HIGH ORDER LINEAR SYSTEMS Abstract Only
Maurice I. Young *In its* Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 72 refs (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 12/2

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-25404# Maryland Univ., College Park.
MODULAR MATRIX MULTIPLICATION ON A LINEAR ARRAY
I. V. Ramakrishnan and P. J. Varman Nov. 1983 25 p Prepared in cooperation with Rice Univ., Houston, TX
(Contract F49620-83-C-0082; AF Proj. 2304)
(AD-A139852; CAR-TR-31; CS-TR-1340; AFOSR-84-0179TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A matrix multiplication algorithm on a linear array using an optimal number of processing elements is proposed. The local storage required by the processing elements and the input/output bandwidth required to drive the array are both constants that are independent of the sizes of the matrices being multiplied. The algorithm is therefore modular, that is, arbitrarily large matrices can be multiplied on a large array built by cascading small arrays. The array is well suited for VLSI implementation. Author (GRA)

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar physics.*

N84-25405# Polish Academy of Sciences, Warsaw. Inst. of Fundamental Technological Research.
THIRTY YEARS OF THE IFTR, ANNIVERSARY VOLUME. SCIENTIFIC ACTIVITIES OF THE POLISH ACADEMY OF SCIENCES INSTITUTE OF FUNDAMENTAL TECHNOLOGICAL RESEARCH IN 1982
Zenon Mroz, ed. 1983 214 p
(ISBN-83-01-05542-1; ISSN-0079-323X) Avail: NTIS HC A10/MF A01

The Polish Academy of Sciences, Institute of Fundamental Technological Research /IFTR/ conducts fundamental research

and its implementation in many fields such as: (1) mathematical and physical foundations of the theory of continuous media, (2) mechanics of materials in elastic and inelastic ranges of behavior taking into account plasticity effects, degradation and fracture/metals, soils, rocks, concretes, polymers, and composites, (3) mechanics of machine and civil engineering structures in both linear and nonlinear domains, (4) generation, propagation and properties of acoustic, ultrasonic and electromagnetic waves, (5) ultrasonic medical diagnostics, (6) structure and synthesis of Polish speech, (7) atomic frequency standards, (8) nondestructive testing of materials and structures. M.A.C.

N84-25406# Middle East Technical Univ., Ankara (Turkey).
MIDDLE EAST TECHNICAL UNIVERSITY JOURNAL OF PURE AND APPLIED SCIENCES, VOLUME 15, NO. 2
Mustafa Erdik, ed. Aug. 1982 105 p refs
Avail: NTIS HC A06/MF A01

Several articles in various fields of applied science and mathematics are presented. Specific topics include: elastic field properties around a epicycloidal hole in an isotropic, compressible medium, upper and lower bounds for locally compact spaces; query execution in distributed data base machine systems; inactivation of transforming DNA in Haemophilus influenza; and fracture initiation toughness in low strength steels. For individual titles, see N84-25407 through N84-25410.

N84-25407# Jiwaji Univ., Gwahor (India). School of Studies in Mathematics.
AN EPICYCLOIDAL HOLE UNDER UNIFORM TANGENTIAL FORCE IN AN INFINITE, ISOTROPIC, COMPRESSIBLE MEDIUM IN SECOND ORDER ELASTICITY **c39**
M. Lal and R. S. Sikarwar *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 107-114 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

The second order elastic field was determined for the case of an isotropic, compressible, infinite medium which has an epicycloidal hole and whose boundaries are subjected to a tangential force. It is found that the results in second order differ significantly from those of the infinitesimal elasticity. Author

N84-25408# Middle East Technical Univ., Ankara (Turkey). Dept. of Mathematics.
LOWER AND UPPER BOUNDS FOR EXP d+(X,Y) **c64**
Bahattin Cengiz *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 115-123 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

Let X, Y be countable locally compact spaces such that there is an order preserving isomorphism from C sub 0 (X) into C sub 0 (Y). Some inequalities involving d(+) (X,Y) and the lengths and orders of X and Y are established. M.G.

N84-25409# Middle East Technical Univ., Ankara (Turkey).
QUERY EXECUTION IN THE DISTRIBUTED RAP DBM SYSTEMS **c82**
A. U. Tansel and E. A. Oezkarahan *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 126-160 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

The features of the RAP database machine (DBM)-based, distributed and generalized database architecture are summarized. A methodology of query processing for such environments is developed. This comprises procedures for query decomposition, subquery analysis, construction of query graph as well as establishment of precedence relationships and move strategies. The network query execution monitor (QEM), which is part of the system being implemented is described. Query execution costs of the system being implemented are analyzed with respect to various join and data movement strategies. M.G.

N84-25410# Middle East Technical Univ., Ankara (Turkey). Faculty of Engineering.
THE EFFECT OF LOADING RATE AND TEMPERATURE ON FRACTURE INITIATION TOUGHNESS IN A LOW STRENGTH STEEL **c26**
Rafet Arikan (Gazi Univ.) and Mustafa Doruk *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 183-207 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

J-integral measurements were made on fatigue precracked Charpy V-notch specimens under static (slow bend) and dynamic loading. The material used was a hot-rolled low strength sheet steel with a thickness of 1 inch. Tests were performed over a temperature range -96 to 70 C. Using the compliance formula J = -(1/B) (dU/da), the static fracture initiation toughness, J sub Ic, and the dynamic fracture initiation toughness, J Sub IcD, were determined as a function of temperature and crack length. The variation of fracture initiation toughness with temperature exhibited a brittle to ductile transition. It was found that due to the difference in loading rate J sub IcD was greater than J sub Ic at temperatures above 0 C and J sub IcD was less than J sub Ic at temperatures below 0 C. M.G.

N84-25411# Middle East Technical Univ., Ankara (Turkey).
MIDDLE EAST TECHNICAL UNIVERSITY JOURNAL OF PURE AND APPLIED SCIENCES, VOLUME 15, NO. 3
Mustafa Erdik, ed. Dec. 1982 99 p refs
Avail: NTIS HC A05/MF A01

Research in pure and applied sciences is reported. Topics reported on include: mineral base lubricant for the cold rolling of aluminum strip; electron paramagnetic resonance study of calcite; effect of iron on the electron paramagnetic resonance spectra of manganese ions in polycrystalline calcite; breakdown of acceleration waves in radiative magneto-fluids; piecewise monotone interpolation and approximation with generalized polynomials; free vibration analysis of uniform and nonuniform cantilever beams by including the effects of transverse shear deformation and rotary inertia; application of regular associated solution model to the liquidus curves of the Sn-Te and Sn-SnS systems. For individual titles, see N84-25412 through N84-25418.

N84-25412# Middle East Technical Univ., Ankara (Turkey). Dept. of Metallugical Engineering.
SELECTION OF A MINERAL-BASE LUBRICANT FOR THE COLD ROLLING OF ALUMINUM STRIP **c27**
Turgay Ertuerk, Tuerker Guerkan, Zuehtue Uysal, and Ali Riza Tekin *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 209-217 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

The ring compression test was used to analyze several fatty acid and vegetable oil additives to a mineral base oil for their friction reducing ability, in selecting a lubricating oil for the cold rolling of aluminum strip. The lubricants were examined for their brown staining propensity. It is found that stearic acid in 5 weight % concentration in the base oil gives the best results in reducing the friction coefficient, with no attendant staining observed. The ranking of the three remaining additives in decreasing order of performance with respect to both friction and staining are: oleic acid, olive oil, and rape-seed oil. It is concluded that the long, saturated, singly and highly polar, straight chain molecules of stearic acid are responsible for its superiority in reducing friction without causing staining. E.A.K.

N84-25413# Middle East Technical Univ., Ankara (Turkey). Dept. of Physics.
ELECTRON PARAMAGNETIC RESONANCE (EPR) STUDY OF CALCITE (CaCO3) CONTAINING BOTH Mn-2+ AND Pb-2+ CATIONS **c72**
A. M. Oezer and M. Aydin *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 219-223 refs (For primary document see N84-25411 15-70)

Avail: NTIS HC A05/MF A01

When a nonparamagnetic divalent ion here Pb(2+) is introduced into the synthetic calcite containing manganese as an impurity, the intensity of the Mn(2+) lines and the resolution of the double line form of the Mn(2+) lines increases because of reducing the exchange and dipole/dipole interactions between adjacent Mn centers. When Pb is in large amount the intensity of the Mn(2+) lines are lowered, but the resolution of the double line/form of the Mn(2+) lines increases. E.A.K.

N84-25414# Middle East Technical Univ., Ankara (Turkey). Dept. of Physics.

EFFECT OF IRON ON THE ELECTRON PARAMAGNETIC RESONANCE (EPR) SPECTRA OF Mn-2+ IONS IN POLYCRYSTALLINE CALCITE **c72**

A. M. Oezer *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 224-232 refs (For primary document see N84-25411 15-70)

Avail: NTIS HC A05/MF A01

Synthetic calcite specimens containing Mn(2+), (Mn(2+), Fe(2+)) and (Mn(2+), Fe(3+)) ions in various concentrations are prepared and their Mn2+ electron paramagnetic resonance (EPR) spectra are studied. It is found that the ratio of the amount of Fe(2+) or Fe(3+) ions to that of Mn(2+) ions must be at a certain value to observe a sufficient change in double-line form of the Mn(2+) EPR spectrum. E.A.K.

N84-25415# Indian Inst. of Tech., Bombay. School of Applied Sciences.

ON THE BREAKDOWN OF ACCELERATION WAVES IN RADIATIVE MAGNETO-FLUIDS **c32**

Arisudan Rai and M. Gaur *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 233-242 refs (For primary document see N84-25411 15-70)

Avail: NTIS HC A05/MF A01

The propagation of acceleration waves in an optically thick medium of electrically conducting fluids was examined. The wave propagation of radiation pressure, effects radiation energy density and heat transfer through thermal radiation and thermal conduction were considered. The growth equation for the variation of amplitude of the wave was solved. It is concluded that all compressive waves with initial amplitude greater than a critical value will grow and terminate into a shock wave due to nonlinear steeping, while all expansion waves will decay out. A critical stage when the compressive wave will either grow or decay is discussed. The effects of the radiation pressure and the radiative heat transfer on the shock formation are analyzed. E.A.K.

N84-25416# Cukurova Univ., Adana (Turkey). Dept. of Mathematics.

PIECEWISE MONOTONE INTERPOLATION AND APPROXIMATION WITH GENERALIZED POLYNOMIALS **c64**

Sermin Atacik *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 243-252 refs (For primary document see N84-25411 15-70)

Avail: NTIS HC A05/MF A01

The solution of approximation and interpolation problems with a given set of generalized polynomials on a real interval was demonstrated. The following approximations are outlined: (1) a continuous function by a copositive generalized polynomial; (2) a continuous function by a comonotone generalized polynomial; (3) interpolation by a piecewise monotone generalized polynomial. E.A.K.

N84-25417# Middle East Technical Univ., Ankara (Turkey). Dept. of Mechanical Engineering.

FREE VIBRATION ANALYSIS OF UNIFORM AND NONUNIFORM CANTILEVER BEAMS BY INCLUDING THE EFFECTS OF TRANSVERSE SHEAR DEFORMATION AND ROTARY INERTIA **c39**

A. Saide Sarigul Aydin and Gueven Aksu *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 253-275 refs (For primary document see N84-25411 15-70)

Avail: NTIS HC A05/MF A01

A method based on the variational principles in conjunction with the finite difference technique is developed to examine the free vibration characteristics of uniform, wedge and truncated wedge cantilever beams by including the effects of transverse shear deformation and rotary inertia. The interlacing grid technique is used to express the stain energy integrals as the summation of the rectangular subdomains and the partial derivatives which appear in the functionals are replaced by the finite difference equations in terms of discrete displacement and rotational components. The numerical results are compared with available solutions and the method of approach is assessed. The effect of variation of truncation ratio on the natural frequency parameters and mode shapes of truncated wedge cantilever beam is analyzed. E.A.K.

N84-25418# Middle East Technical Univ., Ankara (Turkey). Dept. of Metallurgical Engineering.

APPLICATION OF REGULAR ASSOCIATED SOLUTION MODEL TO THE LIQUIDUS CURVES OF THE Sn-Te AND Sn-SnS SYSTEMS **c76**

Huerman Eric *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 277-298 refs (For primary document see N84-25411 15-70)

Avail: NTIS HC A05/MF A01

The liquidus curves of the Sn-Te and Sn-SnS systems were evaluated by the regular associated solution model (RAS). The main assumption of this theory is the existence of species A, B and associated complexes AB in the liquid phase. Thermodynamic properties of the binary A-B system are derived by ternary regular solution equations. Calculations based on this model for the Sn-Te and Sn-SnS systems are in agreement with published data. E.A.K.

N84-25419# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

LA RECHERCHE AEROSPATIALE, BIMONTHLY BULLETIN, NUMBER 1983-S, 216/SEPTEMBER - OCTOBER

Claude Sevestre, ed. Feb. 1984 48 p refs Transl. into ENGLISH by ONERA of La Rech. Aerospatiale, Bull. Bimensuel (Paris), no. 1983-S, 216/Sep. - Oct.

(ESA-TT-836) Avail: NTIS HC A03/MF A01; print copy in ENGLISH available at ONERA, Paris FF 60; original report in FRENCH available at ONERA, Paris FF 60

The efficiency of a combustion chemical laser mostly depends on the configuration of a great number of parameters. Adjusting those parameters is difficult and expensive at the experimental level, requiring more and more sophisticated computational techniques. The present numerical method is used for calculating the laminar transitional or turbulent mixing of two supersonic flows with different chemical compositions and takes into account the effects of the lateral pressure gradient and the chemical reactions. To validate this method, it is compared with a calculation solving the full Navier-Stokes equations in an HF chemical laser cavity. The method is then applied to the study of a DF combustion chemical laser cavity. In particular, it determines the velocity, pressure and temperature fields as well as the chemical species concentrations, DF vibrational populations and laser gain. The introduction of a compressible turbulence model with two transport equations brings out the transitional phenomenon, which appears quite often in chemical lasers. Author

N84-25420# Brookhaven National Lab., Upton, N. Y.

DYNAMICS OF ITINERANT FERROMAGNETS ABOVE T SUB c

G. Shirane, O. Steinsvoll, Y. J. Uemura, and J. Wicksted 1983 22 p refs Presented at the 29th Ann. Conf. on Magnetism and Magnetic Mater., Pittsburgh, 8-11 Nov. 1983

(Contract DE-AC02-76CH-00016)

(DE84-002695; BNL-33765; CONF-831187-17) Avail: NTIS HC A02/MF A01

Current studies of the magnetic scattering, above T/sub c/, from Ni, Fe and Fe (4% - Si) are reviewed. Reliable scattering

functions S(Q, (LC OMEGA)) are obtained up to 50 MeV of energy transfer by combining polarized and unpolarized neutron techniques. Although constant E scans show magnon like peaks in agreement with the previous Oak Ridge data, no peaks are observed in our constant Q scans up to 0.5 A(-1), in contrast to the well defined peak reported by Lynn for Fe(12% - Si). Unexpectedly, for a wide temperature range, the scattering function S(Q, (LC OMEGA)) takes a simple Lorentzian form S(Q, (LC OMEGA) (2)) with GAMMA = (LAMBDA)q(2), where (LAMBDA) is the diffusion constant and kappa the inverse correlation range. At T/sub c/, where GAMMA = Ag(2) (5), this is reduced to a universal scattering function g(0) (5)/(g(5) + ((LC OMEGA)/A) (2)). This scaling gives an entirely new and unified interpretation of magnetic scattering from Ni, Fe and all other isotropic cubic ferromagnets. DOE

N84-25113# Hokkaido Univ., Sapporo (Japan).
THE EFFECT OF ICE TEMPERATURE ON REGELATION VELOCITIES
Shin Tozuka and Gorow Wakahama *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 1-9 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

N84-25114# Hokkaido Univ., Sapporo (Japan).
PLASTIC DEFORMATION OF ICE SINGLE CRYSTALS CONTAINING INCLUSIONS
Masayuki Hashimoto and Gorow Wakahama *In its* Low Temp. Sci., Ser. A, Phys. Sci. 1983 p 11-19 refs In JAPANESE; ENGLISH summary (For primary document see N84-25112 15-42)
Avail: NTIS HC A09/MF A01

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution*.

N84-25421 Defence Research Information Centre, Orpington (England).
THE MEASUREMENT OF ACOUSTIC EMISSION PARAMETERS DURING HYDRAULIC LOADING OF THE NOVOVORENEZH AES REACTOR VESSEL VVER-1000
A. S. Tripalin, G. A. Kuzmin, S. A. Eletskii, Yu. V. Kolomnets, and V. M. Shikhman Nov. 1983 14 p refs Transl. into ENGLISH from Energomashinostr. (USSR), no. 3, 1982 p 33-36
(DRIC-T-6998; BR90147) Copyright. Avail: Issuing Activity

The increase in reliability of nuclear reactors is one of the most important conditions of their widespread use. The apparatus, test methods, and results of an investigation of the pipe union zone of the VVER-100 reactor vessel surface during hydraulic loading by acoustic emission measurements are discussed herein. Results of an analysis of the flow intensity of the acoustic emission signals are presented together with their amplitude distribution. The locations of sources of acoustic emission on the reactor surface are indicated, and a description of the product-transducer acoustic pathway is provided. Author

N84-25422*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF SIMULATED FLIGHT ON THE STRUCTURE AND NOISE OF UNDEREXPANDED JETS
Thomas D. Norum and John G. Shearin May 1984 32 p refs
(NASA-TP-2308; L-15760; NAS 1.60:2308) Avail: NTIS HC A03/MF A01 CSCL 20A

Mean plume static and pitot pressures and far-field acoustic pressure were measured for an underexpanded convergent nozzle in simulated flight. Results show that supersonic jet mixing noise behaves in flight in the same way that subsonic jet mixing noise does. Regarding shock-associated noise, the frequencies of both screech and peak broadband shock noise were found to decrease with flight speed. The external flow determines the dominant screech mode over a wide range of nozzle pressure rations. Change in the screech mode strongly affects both the development of the downstream shock structure and the characteristic frequency of the broadband shock-associated noise. When no mode change occurs, the main effect of the external flow is to stretch the axial development of the shock cells. Author

N84-25423 Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).
CAUSES AND PREVENTION OF SYSTEMATIC DEVIATIONS FROM TRUE VALUES OF ABSORPTION COEFFICIENTS MEASURED IN REVERBERATION ROOMS
W. Kuhl 1984 41 p refs Transl. into ENGLISH from Acustica (West Germany), v. 52, no. 4, 1983 p 197-210
(NRC/CNR-TT-2080; ISSN-0077-5606) Avail: NTIS HC A03/MF A01

When absorption coefficients for materials in a localized arrangement are measured in reverberation rooms, values higher than the true absorption coefficient are obtained even in the case of optimal diffusion. Suggestions for separately measuring the absorption coefficient for randomly incident sound and the increase due to edge diffraction include: (1) two different arrangements of the absorptive material; (2) larger diffusers with much larger total area; (3) the inclination of certain room boundary surfaces and/or the use of a directional microphone; and (4) the calibration of the reverberation room with a material of known impedance and absorption. A.R.H.

N84-25424# Japan Broadcasting Corp., Tokyo. Auditory and Visual Science Research Div.
THE PHYSICAL AND PSYCHOLOGICAL FACTORS GOVERNING SOUND-IMAGE QUALITY
Kohichi Kurozumi and Kengo Ohgushi Mar. 1984 11 p refs Submitted for publication
(NHK-SERIAL-298; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

One of the most important psychological impressions produced by a conventional two-loudspeakers reproduction-system is a localization of the sound image in the horizontal plane. The sound image is localized to some degree by varying the level and the time differences of the two acoustic signals. Even if the sound image was localized in the same direction, different impressions - for example, a feeling of the width of the sound image - are sometimes produced. These different impressions are explained by the phrase sound-image quality. The purpose is to find out the psychological and physical factors governing sound-image quality. To begin with, the effect on sound-image quality of varying the cross-correlation coefficient for white noise is investigated. A number of studies were performed in which the relationship between the cross-correlation coefficient and the sound-image quality were investigated. Author

N84-25425*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INSTALLATION NOISE MEASUREMENTS OF MODEL SR AND CR PROPELLERS
P. J. W. Block May 1984 103 p refs
(NASA-TM-85790; NAS 1.15:85790) Avail: NTIS HC A06/MF A01 CSCL 20A

Noise measurements on a 0.1 scale SR-2 propeller in a single and counter rotation mode, in a pusher and tractor configuration, and operating at non-zero angles of attack are summarized. A measurement scheme which permitted 143 measurements of each of these configurations in the Langley 4- by 7-meter low speed tunnel is also described. A.R.H.

N84-25426*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC MEASUREMENTS OF A FULL-SCALE ROTOR WITH FOUR TIP SHAPES. VOLUME 2: APPENDICES C, D, E AND F
Marianne Mosher Apr. 1984 347 p refs
(NASA-TM-85878-Vol-2; A-9602-Vol-2; NAS 1.15:85878-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 20A

A full scale helicopter with four different blade tip geometries

is tested in a 40- by 80-foot wind tunnel. Performance, loads, and noise are measured. The four tip shapes tested were rectangular, tapered, swept, and swept/tapered. The noise data include measurements of the sound pressure levels in decibels dB, decibels adjusted dBA, and tone-corrected PNdB, for all of the conditions tested. Also included are the detailed measurements, 1/3 octave spectra and time histories for some selected data, and plots of dBA as function of test condition. Some performance measurements are included to aid interpretation of the noise data. M.A.C.

N84-25427# Southampton Univ. (England).
TECHNIQUES AND INSTRUMENTATION FOR THE MEASUREMENT OF TRANSIENT SOUND ENERGY FLUX
P. S. Watkinson and F. J. Fahy Dec. 1983 72 p refs Sponsored by the UK Science and Engineering Research Council
(ISVR-TR-122A) Avail: NTIS HC A04/MF A01

The evaluation of sound intensity distributions, and sound powers, of essentially continuous sources such as automotive engines, electric motors, production line machinery, furnaces, earth moving machinery and various types of process plants were studied. Although such systems are important sources of community disturbance and, to a lesser extent, of industrial health hazard, the most serious sources of hearing hazard in industry are machines operating on an impact principle, such as drop forges, hammers and punches. Controlled experiments to identify major noise source regions and mechanisms are difficult because it is normally impossible to install them in quiet, anechoic environments. The potential for sound intensity measurement to provide a means of overcoming these difficulties has given promising results, indicating the possibility of separation of directly radiated and reverberant sound fields. However, because of the complexity of transient sound fields, a fundamental investigation is necessary to establish the practicability of intensity field decomposition, which is basic to source characterization techniques. Author

N84-25428# Bose Corp., Framingham, Mass.
ACTIVE NOISE REDUCTION
J. Carter Jan. 1984 39 p
(Contract F33615-82-C-0521; AF Proj. 7231)
(AD-A139741; AFAMRL-TR-84-008) Avail: NTIS HC A03/MF A01 CSCL 20/1

Active Noise Reduction (ANR) techniques, singly and in combination with passive hearing protectors, offer the potential for increased sound protection, enhanced voice communications and improved wearability features for personnel exposed to unacceptable noise conditions. An enhanced closed loop active noise reduction system was miniaturized and incorporated into a standard Air Force flight helmet (HGU-26/P). This report describes the theory of design and operation, prototype configuration and operation, and electroacoustic performance and specifications for the ANR system. This system is theoretically capable of producing in excess of 30 decibels of active noise reduction. Electroacoustic measurements on a flat plate coupler demonstrated approximately 20 decibels of active noise reduction with the prototype unit. A performance evaluation of the integrated ANR unit will be conducted under laboratory and field conditions by government personnel to determine the feasibility of the system for use in military applications. Author (GRA)

N84-25429# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
A COMPARISON OF MEASURED TAKE-OFF AND FLYOVER SOUND LEVELS FOR SEVERAL GENERAL AVIATION PROPELLER-DRIVEN AIRCRAFT Final Report
J. F. Wilby and E. G. Wilby Feb. 1984 137 p
(Contract DTFA01-83-P-81230)
(AD-A139901; BBN-5450; FAA-EE-84-9) Avail: NTIS HC A07/MF A01 CSCL 20/1

The Federal Aviation Administration is currently reviewing noise certification procedures for general aviation propeller-driven aircraft. As part of this review noise measurements were made for take-offs and flyovers of several propeller-driven aircraft at Dulles International Airport. The data from the tests were analyzed by FAA in terms of the A-weighted sound level. This analysis indicated that there were general differences between take-off and flyover sound levels. The intent of this report is to present a review of the data without going into detailed analyses. Possible reasons for differences between take-off and flyover sound levels are explored and certain conclusions drawn. Recommendations are then made for future work in order to provide a more-detailed understanding of the physical phenomena involved. GRA

N84-25430# Federal Aviation Administration, Washington, D.C. Office of Environment and Energy.
NOISE MEASUREMENT FLIGHT TEST: DATA/ANALYSES BELL 222 TWIN JET HELICOPTER
J. S. Newman, E. J. Rickley, T. L. Bland, and S. A. Daboin Feb. 1984 215 p
(AD-A139906; FAA-EE-84-1) Avail: NTIS HC A10/MF A01 CSCL 20/1

This report contains documentary sections describing the acoustical characteristics of the subject helicopter and provides analyses and discussions addressing topics ranging from acoustical propagation to environmental impact of helicopter noise. The report is the first in a series of seven documenting the FAA helicopter noise measurement program conducted at Dulles International Airport during the summer of 1983. The Bell 222 test program involved the acquisition of detailed acoustical, position and meteorological data. This test program was designed to address a series of objectives including: (1) evaluation of 'Fly Neighborly' (minimum noise) operating procedures for helicopters, (2) acquisition of acoustical data for use in heliport environmental impact, (3) documentation of directivity characteristics for static operation of helicopters, (4) establishment of ground-to-ground and air-to-ground acoustical propagation relationships for helicopters, (5) determination of noise event duration influences on energy dose acoustical metrics, (6) examination of the differences between noise measured by surface mounted microphone and a microphone mounted at a height of four feet (1.2 meters), and (7) documentation of noise levels acquired using international helicopter noise certification test procedures. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-25431*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CHOPPED MOLECULAR BEAM MULTIPLEXING SYSTEM Patent Application
Billy R. Adams, inventor (to NASA) 19 Apr. 1984 21 p
(NASA-Case-LAR-13174-1; US-Patent-Appl-SN-602105) Avail: NTIS HC A02/MF A01 CSCL 20H

The integration of a chopped molecular beam mass spectrometer with a time multiplexing system is described. The chopping of the molecular beam is synchronized with the time intervals by a phase detector and a synchronous motor. Arithmetic means are generated for phase shifting the chopper with respect to the multiplexer. A four channel amplifier provides the capacity to independently vary the baseline and amplitude in each channel of the multiplexing system. NASA

N84-25432# Argonne National Lab., Ill.
FAST ION ATOMIC SPECTROSCOPY
H. G. Berry, L. Young, L. S. Goodman, L. P. Somerville, J. Hardis, and D. Neek 1984 4 p refs Presented at DOE Atomic Phys. Program Contractors Workshop, Gaithersburg, Md., 26 - 27 Apr. 1984
(DE84-006720; CONF-840841-3) Avail: NTIS HC A02/MF A01

Two collinear fast beam/laser excitation systems, one at the Argonne Dynamitron Accelerator (0.5 to 5.0 MeV beam energy) and another at a small electrostatic accelerator (20 to 130 keV) were set up. The objective is to study fine structure, hyperfine structure and quantum electrodynamic effects of multi-excited

transitions in Li(-) and Li(0), and transitions to high Rydberg states in H(0) and He(0). A sodium jet was simultaneously excited with a laser at the resonance wavelength (D1 or D2 lines) and a 1-MeV He(+) beam to produce excitation to autoionizing Na and Na(+) states. The Auger electron spectra are compared to spectra obtained without laser excitation, and indicate strong variations in final state populations. DOE

N84-25433*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MOLECULAR VELOCIMETRY USING STIMULATED RAMAN SPECTROSCOPY
Reginald J. Exton and Mervin E. Hillard May 1984 23 p refs
(NASA-TM-85808; NAS 1.15:85808) Avail: NTIS HC A02/MF A01 CSCL 20H

Molecular flow velocity of N2 was measured in a supersonic wind tunnel using inverse Raman spectroscopy. This technique employs the large Doppler shift exhibited by the molecules when the pump and probe laser beams are counter-propagating (backward scattering). A retrometer system is employed to yield a vibration-free optical configuration which has the additional advantage of obtaining both the forward and backward scattered spectra simultaneously. The linebreadths and their relative Doppler shift can be used to determine the static pressure, translational temperature, and molecular flow velocity. A demonstration of the concept was performed in a supersonic wind tunnel and included: (1) measurements over the Mach number range 2.50 to 4.63; (2) static pressure measurements (at Mach 2.50) corresponding to a Reynolds number per foot range of 1 to 5 x 10 to the 6th power; and (3) measurements behind the shock wave of a flat plate model. Author

N84-25434*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PAIR PRODUCTION RATES IN MILDLY RELATIVISTIC, MAGNETIZED PLASMAS
Michael L. Burns (Maryland Univ.) and Alice K. Harding May 1984 43 p refs
(NASA-TM-86103; NAS 1.15:86103) Avail: NTIS HC A03/MF A01 CSCL 20H

Electron-positron pairs may be produced by either one or two photons in the presence of a strong magnetic field. In magnetized plasmas with temperatures kT approximately sq mc, both of these processes may be important and could be competitive. The rates of one-photon and two-photon pair production by photons with Maxwellian, thermal bremsstrahlung, thermal synchrotron and power law spectra are calculated as a function of temperature or power law index and field strength. This allows a comparison of the two rates and a determination of the conditions under which each process may be a significant source of pairs in astrophysical plasmas. It is found that for photon densities n(gamma) < or = 10 to the 25th power/cu cm and magnetic field strengths B > or = 10 to the 12th power G, one-photon pair production dominates at kT approximately > sq mc for a Maxwellian, at kT approximately > 2 sq mc for a thermal bremsstrahlung spectrum, at all temperatures for a thermal synchrotron spectrum, and for power law spectra with indices s approximately < 4. Author

N84-25435# New York Univ., New York. Dept. of Chemistry.
INNER-SPHERE REORGANIZATION IN OPTICAL ELECTRON TRANSFER
P. Delahay and A. Dziedzic Mar. 1984 30 p
(Contract N00014-82-K-0113)
(AD-A139722; AD-E401117; NYU/DC/TR-4-NEW SERIES-2) Avail: NTIS HC A03/MF A01 CSCL 20/8

Free energies for photoelectron emission by aqueous solutions of hexaquocations (V2+, Cr2+, Fe2+) - metal complexes (Fe(CN)6 4-, Co (NH3)6 2+) and inorganic anions (OH, C1-, Br-, I-) are calculated from theory and compared with experimental threshold energies. Good agreement is obtained within the estimated error (+ or - 0.2 eV) on emission free energies. The free energy for outer-sphere reorganization is calculated from a continuous medium model. The inner-sphere reorganization energy is obtained from a bond-stretching model for hexaquocations and metal complexes. A new method is developed for the calculation of the inner-sphere reorganization energies of univalent anions from their free energies of hydration, reorganization free energies for electron transfer reactions (V(2+)/(3+), Cr(2+)/(3+), Mn(2+)/(3+), Fe(2+)/(3+), Fe(CN)6 (4-)/(3-) calculated from experimental threshold energies and computed outersphere reorganization free energies yield activation free energies in agreement with the values obtained from kinetic measurements. Improvements are discussed for the determination of threshold energies by extrapolation. Author (GRA)

N84-25436# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
PATTERNS OF ENERGY LEVELS AND SPECTRA FOR POLYATOMIC MOLECULES
William G. Harter (Georgia Inst. of Technology) 1983 28 p refs Presented at the Fractal Structure in Phys. Conf., Washington, 23-26 Nov. 1983
(Contract W-7405-eng-36; Grant NSF PHY-82-07150)
(DE84-007501; LA-UR-84-431; CONF-8311140-1) Avail: NTIS HC A03/MF A01

Laser spectroscopy has revealed a remarkable intricacy in the rotational, vibrational, and electronic energy levels for polyatomic molecules. The infrared spectra of SF6, CF4, and related molecules contain several levels of structure on top of structure which resembles a fractal in some ways. Some of this structure is exhibited and the simplest theoretical interpretations of it which are presently available are introduced. DOE

N84-25437# Brookhaven National Lab., Upton, N. Y.
GENERATION OF INTENSE POLARIZED BEAMS BY SELECTIVE NEUTRALIZATION OF NEGATIVE IONS
A. I. Hershcovitch and E. A. Hinds (Yale Univ.) 1983 7 p refs Presented at the 3rd Intern. Symp. on the Production and Neutralization of Negative Ions and Beams, Upton, N.Y., 14-18 Nov. 1983
(Contract DE-AC02-76CH-00016)
(DE84-007377; BNL-34239; CONF-831180-25) Avail: NTIS HC A02/MF A01

A method based on selective neutralization by laser of negative hydrogen ions in a magnetic field is described. This selectivity is based on the fact that the final state of the neutralized atom depends on nuclear polarization in the magnetic field. A two-scenario approach is to be followed: one in which the resulting neutral atom is in the ground state, and in the other the neutral atom is in the n = 2 level. Limiting factors are discussed. The main advantages of this scheme are the availability of multi-ampere negative ion sources and the possibility to neutralize negative ions with very high efficiency. DOE

N84-25438# Argonne National Lab., Ill.
INTERACTIONS OF FAST ATOMIC AND MOLECULAR IONS WITH MATTER
E. P. Kanter, D. S. Gemmell, and Z. Vager 1984 5 p refs Presented at DOE Atomic Phys. Program Contractors Workshop, Gaithersburg, Md., 26 - 27 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-006555; CONF-840481-2) Avail: NTIS HC A02/MF A01

Brief discussions are presented of research performed in the following areas: microwave field ionization of fast Rydberg atoms; electric field ionization of foil-excited Rydberg states of fast heavy ions; post-foil interaction in foil-induced molecular dissociation; and angular distributions of foil-excited ions bearing inner shell vacancies. DOE

N84-25439# Argonne National Lab., Ill.
ELECTRIC-DIPOLE MOMENT OF CaF BY MOLECULAR-BEAM, LASER-RF, DOUBLE-RESONANCE STUDY OF STARK SPLITTINGS
W. J. Childs, L. S. Goodman, U. Nielsen, and V. Pfeufer Jan. 1984 4 p refs Presented at DOE Atomic Phys. Program Contractors Workshop, Gaithersburg, Md., 26 - 27 Apr. 1984

(Contract W-31-109-eng-38)
(DE84-005413; CONF-840481-1) Avail: NTIS HC A02/MF A01

The electronic structure of diatomic molecules is more complex for open shell systems (radicals) than for the normal closed shell systems, and the development of theoretical understanding which requires a substantial upgrading of experimental knowledge in both quality and quantity. The alkaline earth monohalide family of radicals, with only a single electron outside closed shell cores, was studied. The much weaker spin rotation and hyperfine interactions was investigated. These interactions were studied at high precision in the calcium monohalide family by the molecular beam, laser-RF double resonance technique. The same method is modified and extended to measure the electric dipole moments of these molecules through observation of the Stark splittings of radiofrequency transitions. It is hoped that when considered together, the several types of data will allow understand the ground state electronic wave functions of these molecules. DOE

N84-25440# Ames Lab., Iowa.
MODE-TO-MODE VIBRATIONAL ENERGY TRANSFER IN (1)B2 ANILINE INDUCED BY COLLISIONS WITH CO/SUB 2 M.S. Thesis - Iowa State Univ.
John Francis Hedstrom Jan. 1984 128 p refs
(Contract W-7405-eng-82)
(DE84-007197; IS-T-1076) Avail: NTIS HC A07/MF A01

Single vibronic level fluorescence spectroscopy was used to study intramolecular vibrational energy transfer in low pressure gas samples of (1) B2 aniline induced by collisions with CO2. Vibrational energy transfer was traced from the O(0) vibronic level to eight growth levels. Collision-induced energy transfer for CO2 as the collision gas was seen to follow a flow pattern similar to the pathways found previously for energy transfer in S1 aniline with other collision partners. The magnitude of the normalized mode-to-mode energy transfer rate constants for each collision partner were found to vary roughly in proportion to the overall collision induced decay rate of the O(0) level for each system. DOE

N84-25441# Kansas Univ., Lawrence. Dept. of Chemistry.
MANY-BODY PROCESSES IN ATOMIC AND MOLECULAR PHYSICS Progress Report, 1 Sep. 1983 - 31 Aug. 1984
Shih-I Chu Feb. 1984 36 p refs
(Contract DE-AC02-80ER-10748)
(DE84-007338; DOE/ER-10748/4) Avail: NTIS HC A03/MF A01

Research is reported on: semiclassical many mode Floquet theory; exact semiclassical treatment of nonlinear multiphoton dissociation; nonadiabatic approach for resonant infrared multiphoton absorption spectroscopy; infrared MPD of triatomic molecules, most probable path approach; and complex-coordinate coupled-Landau-channel method for autoionizing resonances of H atoms in intense magnetic fields. DOE

N84-25442# Argonne National Lab., Ill.
SPIRAL KICKER FOR THE BEAM ABORT SYSTEM
R. L. Martin 1983 3 p ref Presented at the Workshop on Accelerator Phys. Issues for a Superconducting Super Collider, Ann Arbor, Mich., 12-17 Dec. 1983
(Contract W-31-109-eng-38)
(DE84-007267; CONF-831264-12) Avail: NTIS HC A02/MF A01

The feasibility of a special kicker to produce a damped spiral beam at the beam dump for the beam abort system was determined. There appears to be no problem with realizing this concept at a reasonably low cost. DOE

N84-25443# Argonne National Lab., Ill.
SHAPE RESONANCES IN MOLECULAR FIELDS
J. L. Dehmer 1984 44 p refs Presented at the 187th Natl. Meeting of the Am. Chem. Soc., St. Louis, 8 Apr. 1984
(Contract W-31-109-eng-38)
(DE84-009206; CONF-840415-18) Avail: NTIS HC A03/MF A01

A shape resonance is a quasibound state in which a particle is temporarily trapped by a potential barrier (i.e., the shape of the potential), through which it may eventually tunnel and escape. This simple mechanism plays a prominent role in a variety of excitation processes in molecules, ranging from vibrational excitation by slow electrons to ionization of deep core levels by X-rays. Moreover, their localized nature makes shape resonances a close connection between shape resonances in electron-molecule scattering and in molecular photoionization. Another is the frequent persistence of free-molecule shape resonant behavior upon adsorption on a surface or condensation into a molecular solid. The basic properties of shape resonance in molecular fields are discussed. Other aspects discussed are vibrational effects of shape resonances, connections between shape resonances in different physical settings, and examples of shape resonant behavior in more complex cases, which form current challenges in this field. DOE

N84-25413# Middle East Technical Univ., Ankara (Turkey). Dept. of Physics.
ELECTRON PARAMAGNETIC RESONANCE (EPR) STUDY OF CALCITE (CaCO3) CONTAINING BOTH Mn-2+ AND Pb-2+ CATIONS
A. M. Oezer and M. Aydin *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 219-223 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

N84-25414# Middle East Technical Univ., Ankara (Turkey). Dept. of Physics.
EFFECT OF IRON ON THE ELECTRON PARAMAGNETIC RESONANCE (EPR) SPECTRA OF Mn-2+ IONS IN POLYCRYSTALLINE CALCITE
A. M. Oezer *In* Middle East Technical Univ. Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 224-232 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N84-25444# Committee on Science and Technology (U. S. House).
HIGH ENERGY PHYSICS FACILITIES
Washington GPO 1984 659 p Hearing before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 55, 19 Oct. 1983
(GPO-30-261) Avail: Subcommittee on Energy Development and Applications

Developments in high energy physics and the activities and plans for high energy physics research facilities are discussed. R.J.F.

N84-25445# Research Inst. of National Defence, Stockholm (Sweden).
MICROEXPLOSIONS IN BOREHOLES
Per Moren Dec. 1983 17 p refs Sponsored by OECD Nuclear Energy Agency
(FOA-C-20523-E1; ISSN-0347-3694) Avail: NTIS HC A02/MF A01

At present micro explosions are the only known source that provides sufficient energy for large scale (about 0.5 to 1 km) seismic crosshole measurements. Results from a test of nondestructiveness on bore-hole walls from micro explosions are summarized. From geophysical well loggings in the holes it was found that only micro explosions with yields of 100 g and greater have a measurable effect on the bore-hole walls. However, the chemical properties of the bore-hole water changed as a result of collodial carbon of the explosive paste. Geophone-recordings from a series of shots with yields in the range 5 up to 200 g showed that the

recorded maximum amplitude was linearly dependent of explosion yield. Author

N84-25446# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
REPORTING OF INDICATION DATA
Bodil Anjar and Mats Gunnerhed Dec. 1983 46 p In SWEDISH; ENGLISH summary
(FOA-C-30352-E; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Inst. of National Defence, Stockholm KR 50

In order to improve nuclear power accident emergency planning, a more rapid and safer reporting of radiation measuring values from the surroundings of a nuclear power plant is needed. On the basis of these measured values, the County Administration has to make a decision concerning evacuation. The needs for information of different interested parties were analyzed, and certain bases for a monitoring organization were stated. The needs are summarized in a specification on demands. Starting from this specification, a principal solution is presented with a number of automatic measuring stations placed in a circle around the nuclear power plant, as well as in certain centers of population. The organization is complemented with patrols. Possible technical solutions are described technically and economically. This pilot study provides a starting point for a decision concerning future purchasing of technical equipment. Author

N84-25447# Mound Lab., Miamisburg, Ohio.
MILLIWATT GENERATOR HEAT SOURCE Progress Report, Jul. - Dec. 1983
Emil A. Mershad 2 Mar. 1984 14 p
(Contract DE-AC04-76DP-00053)
(DE84-008207; MLM-3135) Avail: NTIS HC A02/MF A01

All LANL hardware requirements were met during the reporting period as scheduled. Lot 12 of T-111 alloy sheet and Lot 8 of yttrium platelets were procured to meet future WR production needs. The GEND IP schedule requirements for 49 fueled MC2893 heat sources were met. Pressure burst surveillance activities continued to be conducted in accordance with SNLA document BB328965. Final results of evaluations of two pressure-burst capsules were normal, suggesting that the corresponding heat sources should be in good condition. The hardware production period ended with an overall hardware process yield of 98.4%. DOE

74 OPTICS

Includes light phenomena.

N84-25448 Royal Signals and Radar Establishment, Malvern (England).
THE MULTISTATE REFLECTOMETER
E. J. Griffin Nov. 1983 12 p refs
(AD-A139318; RSRE-Memo-3625; BR90407) Copyright. Avail: Issuing Activity

Established multiport reflectometer theory is applied to show that a simple switched reflectometer employing two RF detectors is calibrated in terms of known standards of voltage reflection coefficient. Design aspects of this multistate reflectometer are considered and distinguishes between its possible application and those of the dual six-port network analyser. GRA

N84-25449# Japan Broadcasting Corp., Tokyo. Auditory and Visual Science Research Div.
A NEW OBJECTIVE METHOD OF EVALUATING IMAGE SHARPNESS
Haruo Isono Feb. 1984 13 p refs
(NHK-SERIAL-296; ISSN-0027-657X) Copyright. Avail: NTIS HC A02/MF A01

Our daily lives are filled with a variety of images, including those produced by computer tomography, and supersonic images, as well as photographs and TV pictures, and the image processing technology of computers has progressed greatly. Although the final estimation of image quality must be made as a subjective evaluation by a human observer, the objective evaluation of image quality is extremely important to image technology, so that image transmission systems are designed rationally and image quality improved. Image sharpness is particularly important as a psychophysical factor affecting the image quality of photographs and TV pictures. Many attempts were made to represent image sharpness using the physical parameters of image transmission systems, and a variety of evaluation methods were proposed for image sharpness. However, conventional sharpness evaluation methods may not fully apply to the evaluation of image sharpness for TV displays new evaluation method incorporating improvements to the calculation of TV image sharpness is proposed. Author

N84-25450*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPTICAL SCANNER Patent Application
Mitchell W. Finkel, inventor (to NASA) Filed 2 May 1984 19 p
(NASA-Case-GSC-12897-1; US-Patent-Appl-SN-606432) Avail: NTIS HC A02/MF A01 CSCL 20F

An optical scanner for imaging lines in an object plane onto a linear array in a focal plane either continuously or discretely is described. The scanner consists of a set of four mutually perpendicularly oriented plane corner mirrors which provide a reflecting path that describes a parallelogram. In addition, there is a plane parallel scanning mirror with a front and back reflecting surface located midway between the first and fourth corner mirrors. It is oriented so that in the mid-scan position it is parallel to the first corner mirror, and therefore perpendicular to the fourth corner mirror. As the scan mirror rotates, rays incident from a plurality of lines in the object plane are selectively directed through the optical system and arrive at a common intersection on the back surface of the scanning mirror. There the rays are colinearly directed toward a lens, and then imaged onto the linear array in the focal plane. NASA

N84-25451# Forschungsinstitut der Deutschen Bundespost, Darmstadt (West Germany).
THE FREQUENCY CHARACTERISTICS OF OPTICAL COMPONENTS USED FOR COMMUNICATION SYSTEMS BASED ON OPTICAL FREQUENCY-DIVISION MULTIPLEX
Remigius Zengerle Dec. 1983 84 p refs In GERMAN; ENGLISH summary
(FI-451-TBr-9) Avail: NTIS HC A05/MF A01

For the fast and accurate determination of the frequency characteristics of optical multiplexer and demultiplexer components, computer controlled measuring equipment having a large dynamic range is described. This equipment is both suitable for monomode and multimode components. The technical data of various multiplexers and demultiplexers corresponding to the present state of technology and based in design on different principles are given according to uniform criteria. The components under consideration are mainly four-channel multiplexers and demultiplexers for one-way transmission as well as transmission and reception duplexers for two-way transmission. Details are given of the negative influence of interference mainly occurring at plug connections on the frequency characteristics of optical multiplexer components. A fiber-optical monomode Fabry-Perot interferometer was constructed to study these interference effects. Author

N84-25452# Maryland Univ., College Park. Computer Vision Lab.
SYNTHESIS OF NATURAL TEXTURES ON 3-D SURFACES
A. Gagalowicz and S. D. Ma Nov. 1983 26 p Sponsored in part by North Atlantic Treaty Organization
(Contract F49620-83-C-0082; AF Proj. 2304)
(AD-A139869; CAR-TR-33; CS-TR-1344; AFOSR-84-0176TR) Avail: NTIS HC A03/MF A01 CSCL 20/6

This paper presents a new method for the synthesis of textures of 3-D surfaces. To the authors' knowledge, one basic technique has been presented up to now in the literature. In this standard method, textures are synthesized by mapping a rectangular template onto the curved surface. This method is

complex, requires substantial computing time, and presents some drawbacks such as the possibility of obtaining aliasing effects and continuity problems along the edges of the curved templates. Procedures to eliminate these problems are available but make this synthesis even more unattractive. The method proposed in this paper does not present the former drawbacks. The authors do not use a template mapping, which is a drawback in itself. The synthesis is achieved continuously on the surface, so that there are no edge effects and also no aliasing effects. This method is a simple extension of a procedure that we have proposed before in the literature for planar textures. Any kind of texture can be reproduced with a good similarity to the reference texture used. It also has the important advantage that only one set of second order statistics (a small amount of data) needs to be computed on a planar version of the reference texture to synthesize this texture on any surface and at any distance. Some results on simple surfaces are displayed (cylinder, sphere), but the method holds for any surface and is relatively quick and easy.
Author (GRA)

N84-25453# Hughes Research Labs., Malibu, Calif.
DEVELOPMENT OF NEW ELECTRO-OPTIC AND ACOUSTO-OPTIC MATERIALS Final Technical Report, 1 Apr. 1981 - 31 Mar. 1983
N. R. Kyle, R. R. Stephens, M. E. Pedinoff, S. R. Sashital, and A. L. Gentile Nov. 1983 94 p
(Contract F19628-81-C-0081; AF Proj. LD16)
(AD-A139946; RADC-TR-83-243) Avail: NTIS HC A05/MF A01 CSCL 20/3

Improved materials are required for active optical devices, including electro-optic and acousto-optic modulators, switches and tunable filters, as well as for new devices based on degenerate four-wave mixing. New materials are also needed for surface acoustic wave (SAW) applications where the lack of materials with large coupling coefficients and inherent temperature stability has limited the bandwidth of SAW devices and made them unsuitable for many microwave applications. In addition, electro-optic and acousto-optic devices are materials limited because the materials currently available are inefficient in terms of power required and often absorb light in the regions in which operation is desired. The primary objectives of this program include the systhesis and evaluation of new ternalry chalcogenides for nonlinear and acoustical applications, and subsequently, the investigation of these materials for applications involving the electro-optic effect, degenerate four-wave mixing and surface acoustic wave technology. GRA

N84-25454# Eastman Kodak Co., Rochester, N. Y. US Apparatus Div.
ULTRA LIGHTWEIGHT MIRROR FABRICATION TECHNOLOGY Final Technical Report, Feb. 1980 - Sep. 1983
J. A. Spina Griffiss AFB, N.Y. RADC Dec. 1983 121 p
(Contract F30602-79-C-0115; ARPA Order 3503; AF Proj. C50-3)
(AD-A140019; CP-00673; RADC-TR-83-265) Avail: NTIS HC A06/MF A01 CSCL 20/6

This document discusses the technology for making ultra lightweight, passive, large optics for cryogenic operation in space. The key to the success of this technology is frit bonding. Frit is used with a new approach to fusion welding glass cores. The techniques for surfacing and mounting such a mirror are also developed. The mirror material is investigated to determine whether its homogeneity is adequate for the performance levels required.
Author (GRA)

N84-25455# Arizona Univ., Tucson. Dept. of Physics.
DEVELOPMENT OF AN INTERFEROMETRIC TECHNIQUE FOR REDUCTION OF BACKGROUND RADIATION AT 10 MICROMETERS Final Report
1984 23 p
(Contract N00014-81-C-0794)
(AD-A140081) Avail: NTIS HC A02/MF A01 CSCL 20/6

This report concerns the final status of the ONR contract entitled Development of an Interferometric Technique for Background Radiation at 10 micrometers. The purpose of the proposed instrument was to improve the detectability of a background limited source in the atmospheric window from 8 to 12 micrometers. Such an improvement would be possible if the photons arising from the source and background could be discriminated interferometrically such that the desired signal photons are preferentially detected. This has been the motivating idea of the devices considered. GRA

N84-25456# Edgerton, Germeshausen and Grier, Inc., Goleta, Calif. Energy Measurements Group.
COMPUTER OPTIMIZATION OF A LINAC INJECTOR TRAJECTORY
Curry Sawyer and J. Lewis Detch, Jr. 1984 13 p refs Presented at the Linear Accelerator Conf., Darmstadt-Seeheim, West Germany, 7 May 1984
(Contract DE-AC03-76SF-00515)
(DE84-005034; EGG-10282-2013; CONF-840529-1) Avail: NTIS HC A02/MF A01

A computer prediction of the beam radius as a function of axial distance for a linac beam can be determined by providing a set of inputs to the computer code, ZFIELD. The electron beam trajectory can be improved by varying the magnet current values in the code, but repeated trials may still not attain the optimum trajectory. Starting with a set of points containing the desired trajectory, the problem can be worked backwards to obtain the necessary magnet currents required by the trajectory. In the example given, a portion of the trajectory was chosen to be parabolic. The trajectory information was used with a differential equation involving beam radius and its derivative to yield the magnetic field as function of axial position. Matrix methods were used to obtain the magnet currents from the magnetic field. DOE

N84-25457# National Bureau of Standards, Washington, D.C. National Measurements Lab.
RETROREFLECTANCE MAP (MEASUREMENT ASSURANCE PROGRAM) SERVICE FOR COEFFICIENT OF LUMINOUS INTENSITY Final Report
K. L. Eckerle and J. J. Hsia Feb. 1984 59 p refs
(PB84-164938; NBS-SP-671; LC-84-601001) Avail: NTIS HC A04/MF A01 CSCL 20F

The accuracy of measurement of coefficient of luminous intensity (R) is verified. The techniques and procedures that are pertinent to participating in the MAP service, as well as a detailed explanation of the error analyses are presented. Uncertainties for both retroreflectance and luminous transmittance were determined from two pilot studies carried out with the assistance of two industrial laboratories and by research performed on the elements of the MAP package. GRA

N84-24606# Societe Anonyme d'Etudes et Realisations Nucleaires, Limeil-Brevannes (France).
IMAGE DISSECTOR TUBE STAR TRACKERS PERFORMANCE: ADVANTAGES AND DRAWBACKS AS COMPARED TO THOSE OF CHARGE TRANSFER DEVICE STAR TRACKERS
H. Bourcier and M. Vite *In* AGARD Guidance and Control Tech. for Advan. Space Vehicles Jan. 1984 18 p In FRENCH and ENGLISH (For primary document see N84-24603 15-12)
Copyright. Avail: NTIS HC A15/MF A01

N84-24678*# Reading Univ. (England). Dept. of Cybernetics.
EXPOSURE TO SPACE RADIATION OF HIGH-PERFORMANCE INFRARED MULTILAYER FILTERS AND MATERIALS TECHNOLOGY EXPERIMENTS (A0056)
John S. Seeley, R. Hunneman, A. Whatley, and Derek R. Lipscombe (British Aerospace Corp.) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 154-157 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

N84-24679*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF SPACE EXPOSURE ON PYROELECTRIC INFRARED

DETECTORS (A0135)
James B. Robertson, Ivan O. Clark, and Roger K. Crouch *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 158 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

N84-24681*# MATRA Service Aerodynamique, Rueil-Malmaison (France). Optical Div.
VACUUM-DEPOSITED OPTICAL COATINGS EXPERIMENT (A0138-4)
A. Malherbe *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 161-162 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

N84-24683*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
OPTICAL FIBERS AND COMPONENTS EXPERIMENT (A01-38-7)
J. Bourrieau *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 165-166 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

N84-24687*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
INVESTIGATION OF THE EFFECTS OF LONG-DURATION EXPOSURE ON ACTIVE OPTICAL SYSTEM COMPONENTS (S0050)
M. Donald Blue, James J. Gallagher, and R. G. Shackelford *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 176-179 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

N84-24688*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FIBER OPTIC DATA TRANSMISSION EXPERIMENT (S0109)
Alan R. Johnston and Larry A. Bergman *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 180-181 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

N84-24689*# Air Force Weapons Lab., Kirtland AFB, N. Mex.
SPACE ENVIRONMENT EFFECTS ON FIBER OPTICS SYSTEMS
Edward W. Taylor *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 182-184 refs (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20F

N84-24753# California Univ., Irvine. Combustion Lab.
OPTICAL MEASUREMENTS OF SOOT SIZE AND NUMBER DENSITY IN A COMPLEX FLOW, SWIRL-STABILIZED COMBUSTOR
G. S. Samuelsen, C. P. Wood, and T. A. Jackson *In* AGARD Combust. Probl. in Turbine Eng. Jan. 1984 15p refs (For primary document see N84-24732 15-25)
(Contract F08635-83-C-0052)
Avail: NTIS HC A19/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-25458*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MAGNETOHYDRODYNAMIC POWER GENERATION
James Lee Smith May 1984 36 p refs
(NASA-TP-2331; NAS 1.60:2331) Avail: NTIS HC A03/MF A01 CSCL 20I

Magnetohydrodynamic (MHD) Power Generation is a concise summary of MHD theory, history, and future trends. Results of the major international MHD research projects are discussed. Data from MHD research is included. Economics of initial and operating costs are considered. Author

N84-25459# Nagoya Univ. (Japan). Inst. of Plasma Physics.
DEPENDENCE OF THE BACKSCATTERING COEFFICIENTS OF LIGHT IONS UPON ANGLE OF INCIDENCE
T. Tabata, R. Ito, Y. Itikawa, N. Itoh, K. Morita, and H. Tawara Feb. 1984 100 p refs
(IPPJ-AM-34) Avail: NTIS HC A05/MF A01

The data on the dependence of the number-backscattering coefficient R(N) and the energy-backscattering coefficient R(E) of H, D, He-3 and He-4 ions upon the angle of incidence theta are compiled into tables. The compilation includes the data generated by computer simulation as well as those obtained experimentally. The references up to the middle of 1983 have been covered. Incident energies of the existing data range from 0.01 to 46 keV. Analytic formulas to express R(N) and R(E) as a function of theta are briefly reviewed. The data compiled are also shown in graphs together with the curves of new analytic formulas developed by the present authors. Author

N84-25460# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EXTRACTION OF VOLUME PRODUCED H(-) OR D(-) IONS FROM A SHEET PLASMA 2
Joshin Uramoto Feb. 1984 34 p refs
(IPPJ-666) Avail: NTIS HC A03/MF A01

A development to large area H(-) or D(-) ion source was tried by using three extraction electrodes: the first electrode bias voltage was set near the wall potential (floating), the second electrode was set near 13% of main extraction voltage and the third electrode was the main acceleration electrode. An ion current of 13 mA (3.3 mA/sq cm) for H(-) or 11 mA (2.8 mA/sq cm) for D(-) at 3 keV was extracted from 9 apertures of 6 mm-phi in 4 sq cm outside of the sheet plasma (14 cm wide and 1.0 cm thick) under a pressure of 7.7 x 10(-4) Torr H2 or D2 gas and a weak magnetic field 50 gauss. Then, it was noted that the corresponding electron current was suppressed below 1/10 of the H(-) or D(-) ion current. M.G.

N84-25461# Nagoya Univ. (Japan). Inst. of Plasma Physics.
START-UP AND QUASI-STATIONARY DRIVE OF PLASMA CURRENT BY LOWER HYBRID WAVE IN THE JPII T-IIU TOKAMAK
K. Toi, K. Ohkubo, K. Kawahata, Y. Kawasumi, K. Matsuoka, N. Noda, Y. Ogawa, K. Sato, S. Tanahashi, T. Tetsuka et al Feb. 1984 13 p refs
(IPPJ-667) Avail: NTIS HC A02/MF A01

A plasma current is initiated and raised up to a quasi-stationary level of about 20 kA by injecting the lower hybrid wave into a cold and low density plasma produced by electron cyclotron resonance. The plasma current rises more slowly than the experimentally obtained L sub p/R sub p magnetic diffusion time of the bulk plasma. The current rise time decreases with the increase of the bulk electron density, and agrees well with the collision time of the current-carrying high energy electrons with the bulk plasma. Author

N84-25462# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HEAVY ION BEAM PROBE FOR THE STUDY OF PLASMA CONFINEMENT IN NAGOYA BUMPY TORUS
K. Takasugi, H. Iguchi, M. Fujiwara, and H. Ikegami Mar. 1984 42 p refs
(IPPJ-669) Avail: NTIS HC A03/MF A01

The heavy ion beam probing system was constructed for the

study of plasma confinement in the Nagoya Bumpy Torus (NBT-1/1M). Not only the plasma space potential but also the electron density multiplied by a function of the electron temperature nf(T sub e) can be measured with a good spatial resolution. The feedback controlled detection technique is used for steady state measurements, and the time resolved fast detection technique is used for pulsed measurements. The effects of the hot electron beta and the plasma space potential on the beam orbit were analyzed. It is confirmed that these effects on the observation points are usually small and neglected in standard operation modes. The possibility of the measurement of the hot electron beta from the shifts of the primary beam orbits is also discussed. Author

N84-25463# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ABLATION ACCELERATOR (ABLAC) AS DRIVER FOR IMPACT FUSION
Kazunari Ikuta, Isao Ueno (Tokyo Univ.), and Mitsumori Tanimoto Feb. 1984 16 p refs
(IPPJ-668) Avail: NTIS HC A02/MF A01

The design of an ablation accelerator suitable as driver for impact fusion and of a projectile to be accelerated by the accelerator is discussed. The proposed approach which offers an attractive option to accelerate the iron projectile to a hypervelocity suitable to fusion applications uses a relativistic electron beam which can be transported from the beam source to the projectile for ablation the base of the projectiles. The base of the projectile is irradiated intermittently by a series of electron sources arranged by the path of the projectile. A.R.H.

N84-25464# Cornell Univ., Ithaca, N.Y. Lab. of Atomic and Solid State Physics.
DENSE COULOMB PLASMAS: QUANTUM STATISTICS AND ORDERING
N. W. Ashcroft and J. Oliva (California Univ., Livermore, Lawrence Livermore Lab.) [1983] 4 p refs
(Grant NSF DMR-80-20429)
Avail: NTIS HC A02/MF A01

The low temperature equilibrium and transport properties of dense liquid metallic phases of hydrogen and deuterium are examined. Both systems can be regarded as dense Coulomb plasmas, but are considered in temperature ranges where the statistical differences are strikingly evident. Author

N84-25465# Science Applications, Inc., McLean, Va.
PLASMA PHYSICS ISSUES IN ADVANCED SIMULATION RESEARCH Final Report, 24 Nov. 1980 - 24 Sep. 1982
A. Mondelli 1 Nov. 1983 166 p
(Contract N00014-81-C-2041)
(AD-A139628; AD-E001641; SAI-84-235-WA) Avail: NTIS HC A08/MF A01 CSCL 20/9

The material covered in this report consists of three general areas in which plasma physics plays a significant role in the modeling of radiation sources for the advanced simulation research program. The first is the description of a basic model for the implosion of a system of identical wires driven by a pulsed power generator. The second is a model for computing the linear ideal MHD instability growth rates for azimuthally symmetric, cylindrical Z pinch equilibria. This analysis includes both kink and sausage type perturbations of the equilibrium. The third area concerns the properties of magnetically insulated power feeds for driving imploding Z pinch loads. GRA

N84-25466# Naval Research Lab., Washington, D. C.
CHANNEL COOLING BY TURBULENT CONVECTIVE MIXING
J. R. Greig, R. E. Pechacek, and M. Raleigh 12 Mar. 1984 25 p
(ARPA Order 4395; RR0-1109)
(AD-A139724; AD-E401117; NRL-MR-5280) Avail: NTIS HC A02/MF A01 CSCL 20/9

Results from a series of experiments are described which show that hot, reduced-density channels in the atmosphere usually cool by a process of turbulent convective mixing. Five different types of channels were created (1) by the interaction of a pulsed CO2 laser with aerosols in the atmosphere, (2) by electric discharges in the atmosphere, (3) by laser-guided, electric discharges in the atmosphere, and (4) and (5) by the absorption of CO2 laser radiation in nitrogen doped with sulfur hexafluoride. For channels in which the energy deposition was almost cylindrically symmetric and axially uniform, (5), the rate of cooling, after reaching pressure equilibrium, was within an order of magnitude of thermal conduction. But for channels in which the energy deposition was asymmetric and/or non-uniform, the rate of cooling was typically one thousand times faster than thermal conduction (for channels whose radius at pressure equilibrium was approx. = 1 cm). These channels were seen to be turbulent and to cool by mixing cold, surrounding air into the hot channel. Such turbulence has been explained by Picone and Boris in terms of a residual vorticity that is caused by the non-cylindrical energy deposition. A simple empirical formula is deduced relating the rate of cooling (growth of channel envelope) to the radius of the channel at pressure equilibrium and to the ambient sound speed, which indicates that the effect of velocity/turbulence saturates for variations in the energy deposition of greater than about 2 to 1.
Author (GRA)

N84-25467# Harry Diamond Labs., Adelphi, Md.
ON THE FORM OF THE COLLECTIVE BREMSSTRAHLUNG RECOIL FORCE IN A NONEQUILIBRIUM RELATIVISTIC BEAM-PLASMA SYSTEM Technical Report
H. E. Brandt Jan. 1984 38 p
(DA Proj. 1L1-61101-A-91-A)
(AD-A139895; HDL-TR-2026) Avail: NTIS HC A03/MF A01 CSCL 20/8

The general form is derived, from first principles, for the collective bremsstrahlung recoil force on a test particle participating in a bremsstrahlung process in a relativistic nonequilibrium beam-plasma system. The force is expressed in terms of the particle and photon distribution functions and the bremsstrahlung transition rate. This relationship is needed in calculations of collective radiation processes and the conditions for the occurrence of bremsstrahlung radiative instability in relativistic beam-plasma systems. Author (GRA)

N84-25468# Air Force Weapons Lab., Kirtland AFB, N. Mex.
A Z-PINCH PHOTO-PUMPED PULSED ATOMIC IODINE LASER Final Report, Oct. 1981 - Sep. 1982
D. H. Stone, D. P. Saunders, and M. C. Clark Mar. 1984 30 p
(AF Proj. ILIR)
(AD-A140033; AFWL-TR-83-33) Avail: NTIS HC A03/MF A01 CSCL 20/5

A pulsed atomic iodine laser (CF3I) was designed and constructed using a coaxial xenon flash lamp as a pump source. The flash lamp was operated at low pressure to obtain pulse compression via xenon self-pinch. Electrical and optical diagnostics were performed for various xenon and CF3I pressures. Calorimeter data and burn patterns were obtained for the laser. Time-resolved spectroscopic data were taken throughout the CF3I pump band.
Author (GRA)

N84-25469# GA Technologies, Inc., San Diego, Calif.
NONLINEAR THEORY OF LOWER HYBRID CURRENT DRIVE II
V. S. Chan, C. S. Liu, P. L. Andrews, and F. W. McClain Feb. 1984 17 p refs Presented at the 4th Intern. Symp. on Heating in Toroidal Plasmas, Rome, 21-28 Mar. 1984
(Contract DE-AT03-84ER-53158; GA Proj. 3411)
(DE84-007292; GA-A-17450; CONF-840311-1) Avail: NTIS HC A02/MF A01

Lower hybrid waves in current drive experiments cause the electron distribution to become unstable to magnetized plasma waves via the anomalous Doppler resonance. This instability effectively transfers momentum from high phase velocity LH waves to lower phase velocity plasma waves and also increases the perpendicular tail temperature by wave pitch-angle scattering. Both contribute to a large energetic electron population leading to significant current sustainment. This theory provides good qualita-

tive agreement not only in magnitudes but also in general trends with experimental observations. DOE

N84-25470# Hanford Engineering Development Lab., Richland, Wash.
CONTRIBUTION TO THE 6TH ANNUAL REPORT ON SPECIAL PURPOSE MATERIALS FOR MAGNETICALLY CONFINED FUSION REACTORS: SOLID BREEDER MATERIALS
G. W. Hollenberg and D. L. Baldwin 1984 30 p refs
(Contract DE-AC06-76FF-02170)
(DE84-008181; HEDL-7437) Avail: NTIS HC A03/MF A01

Tritium and helium retention of solid breeder materials for D-T fusion reactors are evaluated and compared. Data necessary for the design of solid breeder irradiation experiments were obtained. The performance of lithium ceramic materials during fast neutron irradiation in support of solid breeder blanket designs was also studied. B.G.

N84-25471# Rockwell International Corp., Golden, Colo. Energy Systems Group.
PLASMA BEHAVIOR IN VACUUM COATING USING HOT HOLLOW CATHODE: A LITERATURE SURVEY AND PROPOSAL FOR EXPERIMENT
Y. S. Kuo and G. A. Riordan, ed. 26 Jan. 1984 63 p refs
(Contract DE-AC04-76DP-03533)
(DE84-007907; RFP-3558) Avail: NTIS HC A04/MF A01

The plasma behavior in a sputtering device is closely associated with its coating performance. The same may hold true for the hot hollow cathode (HHC) deposition. The plasma behavior of a HHC coating devices received relatively meager research. A literature study was conducted on the HHC coating technology, taking special consideration of the plasma conditions in the HHC coating chamber. Two types of experiments are proposed. The first type is the silver coating experiments using the voltage bias applied to the stainless steel substrates as an independent variable. The deposition rates and substrate ion current are monitored. The coatings obtained will be examined for their metallographic structure and the compositional depth profiling at their coating-substrate interfaces. The second type is the plasma characterization experiments; the Langmuir probe measurement of plasma characteristics, and the ion collector type of measurement to mass and energy-analyze the ionic, and the (energetic) neutral, species in the plasma. DOE

N84-25472# Science Applications, Inc., La Jolla, Calif.
REVERSED-FIELD PINCH DYNAMICS AND TRANSPORT STUDIES Quarterly Progress Report, 20 Oct. 1983 - 20 Jan. 1984
Dalton D. Schnack 20 Mar. 1984 6 p
(Contract DE-AC03-83ER-53150)
(DE84-009054; DOE/ER-53150/T3; QPR-3) Avail: NTIS HC A02/MF A01

Progress in RFP dynamics and transport studies is described. A three dimensional, incompressible MHD code was developed, and is being checked against known results. It is computationally more efficient than the existing code, and will be used extensively if compressibility is determined to be unimportant. Post processor codes to analyze data generated by the nonlinear code were developed. Three dimensional computer runs at low theta(=B/sub theta/(a)/,B/sub z/>) have found the development of a substantial stochastic core, with good flux surfaces being retained in the outer part of the discharge. Runs at high theta have shown complete stochasticity, with reappearance of outer flux surfaces as the modes saturate and relax. Anomalous maintenance of positive toroidal flux arising from a poloidal electric field at the field reversal surface induced by MHD fluctuations (dynamo) was observed. These results were documented in a publication. Statistical analysis of stochastic magnetic field regions to assess transport coefficients is underway. DOE

N84-25473# Los Alamos Scientific Lab., N. Mex.
INAPPROPRIATENESS OF THE FINITE LARMOR RADIUS MODEL FOR THE TILTING MODE IN FIELD REVERSED CONFIGURATIONS
J. L. Schwarzmeier and C. E. Seyler 1984 5 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007467; LA-UR-84-632; CONF-840255-15) Avail: NTIS HC A02/MF A01

Numerical results are presented of the finite Larmor radius (FLR) treatment of the tilting mode as described by Seyler and Barnes. Two principal results are examined. First, the FLR theory of tilting has singularities at the magnetic axis that make application of the theory unphysical. Second, numerical results are presented showing that for current experiments the magnetic moments of the ions are poorly conserved at the tips of the flux surfaces in an FRC, and therefore there is a priori reason to view an FLR theory as suspect for global modes in FRCs. DOE

N84-25474# Stanford Univ., Calif. High Temperature Gasdynamics Lab.
HIGH MAGNETIC FIELD MHD GENERATOR PROGRAM Final Report, 1 Oct. 1979 - 29 Feb. 1984
R. H. Eustis, C. H. Kruger, M. Mitchner, S. A. Self, J. K. Koester, and T. Nakamura Feb. 1984 136 p refs
(Contract DE-AC22-80ET-15611)
(DE84-007690; DOE/ET-15611/15) Avail: NTIS HC A07/MF A01

Experimental and theoretical research was conducted to investigate phenomena that are expected to be important in the development of MHD power generation. In several areas, advanced diagnostics were developed to permit experimental measurements which could be compared with theory. The areas under investigation are: effects of nonuniformities on generator performance, stability phenomena, boundary layer phenomena, Hall field breakdown, electrode configuration and current concentrations, disk generator studies, and linear generator experiments at high fields. The motivation and objectives of the work are reported in the several areas and collects in one place many of the important results. Detailed accounts of the methods and findings in each area are given in specific publications that are listed. DOE

N84-25475# Argonne National Lab., Ill.
MAGNETOHYDRODYNAMIC POWER GENERATION, ELECTROMAGNETIC PUMPS, HEAT PIPES, AND THERMIONIC CONVERTORS
E. S. Pierson (Purdue Univ.), K. A. Bonyhady, P. F. Dunn, R. D. Nathenson (Westinghouse Electric Corp.), and K. L. Uherka 1984 20 p refs
(Contract W-31-109-eng-38)
(DE84-009195; DOE/NBM-4009195) Avail: NTIS HC A02/MF A01

The basic principles of operation, components, and design of MHD generators, electromagnetic pumps, heat pipes and thermionic converters are described. DOE

N84-25476# Oak Ridge National Lab., Tenn.
RECENT PROGRESS ON ATF
G. H. Neilson 1984 12 p Presented at the US-Japan Workshop on Heliotron-E Results, Kyoto, Japan, 13-17 Feb. 1984
(Contract W-7405-eng-26)
(DE84-007523; CONF-840265-1) Avail: NTIS HC A02/MF A01

The ATF experiment will test improvements to high beta, steady state toroidal confinement using external helical fields. The device design was optimized to: (1) provide direct access to the high beta second stability regime, (2) have sufficient flexibility to study a large range of toroidal configurations both with and without plasma current, (3) test the reduction of low collisionality transport by EXB drifts induced by the self consistent radial electric field, and (4) permit steady state, high beta operation without disruptions. Continued physics studied at ORNL and recent results from foreign stellarator experiments have increased confidence in ATF performance. DOE

N84-25477# Los Alamos Scientific Lab., N. Mex.
ONE-DIMENSIONAL TRANSPORT CODE FOR FIELD-REVERSED CONFIGURATIONS
E. J. Caramana, M. Y. Hsiao, and J. L. Schwarzmeier 1984 5 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007449; LA-UR-84-631; CONF-840255-16) Avail: NTIS HC A02/MF A01

A radial transport code for Field-Reversed Configurations (FRCs) is described. Assuming quasi-neutrality and neglecting inertia and viscous force, the evolution of particle densities, temperatures, and magnetic field through a series of equilibrium states is simulated. To solve the equations, transformations of all dependent variables and the one independent variable are carried out. The processes of interest can be decoupled into two distinctive sets of equations that describe adiabatic and nonadiabatic processes. These sets of equations are then solved by two alternating steps adiabatic and nonadiabatic. Author

N84-25478# Los Alamos Scientific Lab., N. Mex.
SUSTAINMENT DYNAMO REEXAMINED: NONLOCAL ELECTRICAL CONDUCTIVITY OF PLASMA IN A STOCHASTIC MAGNETIC FIELD
Abram R. Jacobson and Ronald W. Moses 1984 5 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007485; LA-UR-84-524; CONF-840255-17) Avail: NTIS HC A02/MF A01

The plasma dynamo is both an intriguing and a practical concept. The intrigue derives from attempting to explain naturally occurring and man made plasmas whose strong field aligned currents j/sub parallel/ apparently disobey the most naive Ohm's law j/sub parallel/ = sigma/sub parallel/E/sub parallel/. The practical importance derives from the dynamo's role both in formation and in sustainment of reversed field pinch (RFP) and Spheromak fusion plasmas. Certain features of the documented quasi-steady discharges on ZT-40M, and RFP in apparent need of a sustainment dynamo are examined. The tail electrons (which carry j/sub parallel/) are probably wandering (along stochastic B Vector-field lines) over much of the minor radius in one mean free path. DOE

N84-25479# Los Alamos Scientific Lab., N. Mex.
TRANSPORT, STABILITY AND RELAXATION OF A SPHEROMAK
A. G. Sgro, G. Marklin, and A. A. Mirin (California Univ., Lawrence Livermore Lab.) 1984 3 p refs Presented at the 6th US-Japan Symp. on Compact Toroid Res., Princeton, N.J., 20-23 Feb. 1984
(Contract W-7405-eng-36)
(DE84-007285; LA-UR-84-630; CONF-840255-11) Avail: NTIS HC A02/MF A01

A zero-(BETA) Spheromak contained in a rectangular region having perfectly conducting boundaries in its minimum energy state is considered, and its evolution calculated. Since this state is a stable equilibrium, the initial evolution of the plasma is caused by diffusion. This is simulated using a transport code. When q at the magnetic axis drops, q(r) becomes flat. When q on axis drops below 0.5, the Spheromak becomes unstable to an n = 2 kink. The plasma is then modeled dynamically; the kink displacement saturates and eventually reverses when a reconnection occurs. A new magnetic axis begins to form as the plasma relaxes toward a minimum energy state. DOE

N84-25480# California Univ., Berkeley. Lawrence Berkeley Lab. Physics Dept.
HOPF BIFURCATION AND THE BEAM-PLASMA INSTABILITY
John David Crawford Jan. 1984 35 p refs Presented at the Am. Math. Soc. Res. Conf. on Fluids and Plasmas: Geometry and Dyn., Boulder, Colo., 17-23 Jul. 1983
(Contract DE-AC03-76SF-00098)
(DE84-008243; LBL-17148; CONF-8307112-2) Avail: NTIS HC A03/MF A01

For finite mode instabilites in dissipative systems, invariant manifold methods allow the bifurcation analysis to be reduced to the locally attracting center manifold. In a kinetic model of electron plasma dynamics, these methods are applied to the one mode beam plasma instability which occurs via Hopf bifurcation. The instability results in a nonlinear oscillation, and the amplitude equation is solved to describe the time aymptotic state. DOE

N84-24655*# TRW Space Technology Labs., Redondo Beach, Calif.
SPACE PLASMA HIGH-VOLTAGE DRAINAGE EXPERIMENT (A0054)
William W. L. Taylor and Gene K. Komatsu *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 82-85 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20I

N84-25058*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STATUS OF PLASMA PHYSICS TECHNIQUES FOR THE DEPOSITION OF TRIBOLOGICAL COATINGS
Taialdis Spalvins *In its* Tribology in the 80's, vol. 2 Apr. 1984 p 729-750 refs (For primary document see N84-25047 15-37)
Avail: NTIS HC A17/MF A01 CSCL 20I

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-25481*# Midwest Research Inst., Kansas City, Mo.
CONTAINERLESS HIGH TEMPERATURE PROPERTY MEASUREMENTS BY ATOMIC FLUORESCENCE Final Technical Report
R. A. Schiffman and C. A. Walker May 1984 63 p refs
(Contract NAS8-34383)
(NASA-CR-171038; NAS 1.26:171038) Avail: NTIS HC A04/MF A01 CSCL 20L

Laser induced fluorescence (LIF) techniques for containerless study of high temperature processes and material properties was studied. Gas jet and electromagnetic levitation and electromagnetic and laser heating techniques are used with LIF in earth-based containerless high temperature experiments. Included are the development of an apparatus and its use in the studies of (1) chemical reactions on A02O3, molybdenum, tungsten and LaB6 specimens, (2) methods for noncontact specimen temperature measurement, (3) levitation jet properties and (4) radiative lifetime and collisional energy transfer rates for electronically excited atoms. Author

N84-25482# Valvo Roehren- und Halbleiterwerke der Philips G.m.b.H., Hamburg (West Germany). Produktbereich MOS-ICs.
NONVOLATILE, ELECTRICALLY ERASABLE PROGRAMMABLE ROM Final Report, Oct. 1982
Adel El-Dessouky Bonn Bundesministerium fuer Forschung und Technologie Jan. 1984 73 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-008; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15,50

The processing technology for integration of MNOS-EEPROMs and NMOS Logic was investigated as p-well isolation. Memory characteristics of both Si gate and metal gate MNOS devices are investigated for nitride constitution which aims for lower programming voltages and good memory performance. The complete fabrication process for 128 byte SNOS-EEPROM chip is described by using high voltage depletion MOS devices in p-well technology. Another test vehicle uses 4 x 4 metal gate MNOS array to demonstrate possible fabrication of 12 V programmable scaled

MNOS devices with 10 years retention after 10 to the 5th power endurance. E.A.K.

N84-25483# Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
OXIDE BOND ENERGIES FOR THE CALIBRATION OF MATRIX EFFECTS IN SECONDARY ION MASS SPECTROMETRY Interim Technical Report
A. A. Galuska and G. H. Morrison 28 Mar. 1984 37 p
(Contract N00014-80-C-0538)
(AD-A139633; TR-13) Avail: NTIS HC A03/MF A01 CSCL 20/12

Analyses of trace and major elements in group III-V compound matrices by secondary ion mass spectrometry (SIMS) have shown that practical ion yields are linearly related to the matrix composition. The affinity of the matrix to oxygen appears to be the critical factor in this relationship. A direct relationship between the sloped of these calibration lines, determined for elements in the same column of the periodic table, and the first ionization potential of the respective elements has also been shown. Author (GRA)

N84-25484# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
UNDOPED BUFFER LAYER DEVELOPMENT Final Technical Report, 1 Mar. 1981 - 31 Mar. 1983
D. Miller Jan. 1984 59 p
(Contract F49620-81-C-0038; AF Proj. 2306)
(AD-A139758; MRDC41086.3FTR; AFOSR-84-0231TR) Avail: NTIS HC A04/MF A01 CSCL 20/2

This program focused on the growth and analysis of epitaxial layers using three different techniques which have been successful in producing high purity, high mobility, epilayer material for device applications. These included molecular beam epitaxy (MBE), metalorganic chemical vapor deposition (MOCVD), and vapor phase epitaxy. Application of characterization techniques such as SIMS (Secondary Ion Mas Spectrometry), infrared absorption, photoluminescence, deep level transient spectroscopy, and photoconductivity has allowed progress to be made in understanding the major deep impurity centers in semi-insulating epitaxial GaAs. Author (GRA)

N84-25485# Oklahoma State Univ., Stillwater. Dept. of Physics.
STUDY OF DEFECTS PRODUCED BY THE GROWTH, POST TREATMENT AND FABRICATION OF QUARTZ Final Technical Report, 15 Apr. 1980 - 30 Jun. 1983
L. E. Halliburton, J. E. Martin, and W. A. Sibley Griffiss AFB, N.Y. RADC Jan. 1984 131 p
(Contract F19628-80-C-0086; AF Proj. 2306)
(AD-A139834; RADC-TR-83-309) Avail: NTIS HC A07/MF A01 CSCL 20/2

In order to better understand the electrodiffusion process, we have systematically investigated various aspects of sweeping. Current-versus-time curves show an initial decay followed by a steady current. We believe that this steady current represents the migration of only one species of ion through the crystal. Once this steady state is reached, the temperature is slowly lowered and the ionic conductivity is measured versus temperature to obtain the activation energy. Alkalis show activation energies between .76 and 1.24 eV, while hydrogen showed an activation energy of 1.5 to 1.9 eV. Low-temperature IR absorption spectra, ESR spectra, and acoustic loss measurements were used to characterize the effects on the point defects of alkali and hydrogen electrodiffusion. Four-point bend fracture tests were carried out on a series of AT-cut samples as a function of etching and hydrogen sweeping. Etched samples from hydrogen-swept bars showed a greater fracture strength (i.e., were more difficult to fracture) than etched samples from similar unswept bars. GRA

N84-25486# Litton Systems, Inc., Morris Plains, N. J. Airtron Div.
MANUFACTURING METHODS AND TECHNOLOGY ENGINEERING FOR 'GROWTH OF LARGE DIAMETER ND:YAG LASER CRYSTALS' Final Technical Report, 1 Oct. 1979 - 31 Mar. 1983
R. Uhrin and R. F. Belt Jul. 1983 149 p
(Contract DAAB07-77-C-0375)
(AD-A139902) Avail: NTIS HC A07/MF A01 CSCL 13/8

This report describes Czochralski growth experiments on a production process for Nd:YAG boules. At program start most production techniques gave a boule about 1.25 - 1.50 inch diameter and 5 - 7 inches long. A goal of 2 inches in diameter, with similar length and quality, would nearly double laser rod yield for many Army programs. All experiments were performed on standard growth stations in a production facility. GRA

N84-25487# Temple Univ., Philadelphia, Pa. Dept. of Chemistry.
FLUORESCENT GUESTS IN THERMOTROPIC AND CHIRALITY IN LYOTROPIC LIQUID CRYSTALS Final Report, 1 Nov. 1980 - 31 Jan. 1984
M. M. Labes Mar. 1984 35 p
(Contract DAAG29-81-K-0003)
(AD-A139985; ARO-17464.5-CH) Avail: NTIS HC A03/MF A01 CSCL 20/2

Three problems were examined under this program. Firstly, a novel electro-optical display concept has been developed in our laboratory involving the incorporation of fluorescent (emissive) guest molecules into a cholesteric liquid crystal host. Improvements were made in the contrast ratios of such displays via electrochemical quenching. Secondly, a fundamental study was completed on the nature phase transitions in thermotropic liquid crystals confined in porous polymer films. Finally, new lyotropic fluid crystals were investigated to (1) try to develop non-aqueous lyotropic media, and (2) investigate orientational ordering and solubility of guest molecules in lyotropic nematics and cholesterics. GRA

N84-25488# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH Quarterly Technical Summary Report, 1 May - 31 Jul. 1983
A. L. McWhorter 15 Aug. 1983 116 p
(Contract F19628-80-C-0002; AF Proj. 649L)
(AD-A140027; ESD-TR-83-051; Rept-1983; Rept-3) Avail: NTIS HC A06/MF A01 CSCL 20/12

Contents: Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Analog Device Technology. GRA

N84-25489# Cornell Univ., Ithaca, N.Y. School of Electrical Engineering.
MICROWAVE, SEMICONDUCTOR RESEARCH - MATERIALS, DEVICES AND CIRCUITS Annual Technical Report, 1 May 1982 - 30 Apr. 1983
L. F. Eastman, D. W. Woodard, G. W. Wicks, J. Ballantyne, and C. L. Tang Mar. 1984 59 p
(Contract F49620-82-C-0083)
(AD-A140052) Avail: NTIS HC A04/MF A01 CSCL 20/12

This program covers the growth and assessment of Gallium Arsenide, and related compounds and alloys, for use in microwave, millimeter, and optical devices. It also covers the processing of the material into devices, and the testing of the devices. Both molecular beam epitaxy (MBE) and organo-metallic vapor phase epitaxy (OMVPE) are used for growth. Materials assessment is included. Short modulation doped heterojunction transistors, as well as ballistic electron vertical FETs and heterojunction bipolar transistors, are covered. GRA

N84-25490# Florida State Univ., Tallahassee.
POLYMERS IN MECHANOCHEMICAL SYSTEMS: STRUCTURE-PROPERTY REQUIREMENTS Progress Report, 1 Jun. 1983 - 31 May 1984
Leo Mandelkern 1984 15 p refs
(Contract DE-AS05-80ER-10655)
(DE84-007290; DOE/ER-10655/5) Avail: NTIS HC A02/MF A01

Research carried out during this period was concerned with mechanical properties and ultimate strength of the polyethylenes,

the analysis of low frequency dynamic mechanical behavior, and studies of the carbon-thirteen crystalline spin-lattice relaxation times in these polymers. The basic principle underlying all these studies is control of the major independent structural variables which govern the properties in the semi-crystalline state. The ultimate properties, strain and tensile strength at break, were found to be dependent on molecular weight and to be independent of the level of crystallinity and supermolecular structure. The yield stress depends primarily on the level of crystallinity, while the initial modulus depends in a complex manner on molecular weight, crystallinity and crystallite thickness. The low frequency, low temperature relaxation is shown to be a characteristic of the noncrystalline region and a significant difference in magnitude is found between the linear and branched polymers. DOE

N84-25491# Argonne National Lab., Ill.
ELECTRON SCATTERING: LECTURES GIVEN AT ANL
John Dirk Walecka (Stanford Univ.) Jan. 1984 483 p refs
(Contract W-31-109-eng-38)
(DE84-006689; ANL-83-50) Avail: NTIS HC A21/MF A01

An almost verbatim copy of lectures on Electron Scattering given at Argonne National Laboratory in the fall of 1982 by John Dirk Walecka are reported. Broad headings include general considerations, coincidence cross section (e,e'x), quantum electrodynamics and radiative corrections, unification of electroweak interactions, relativistic models of nuclear structure, electroproduction of pions and nucleon resonances, and deep inelastic (e,e'). DOE

N84-25492# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
PULSED MAGNETIC FIELD TESTING OF MULTIFILAMENTARY Nb3Sn SUPERCONDUCTING WIRE
J. Glazer, D. R. Dietderich, and J. W. Morris, Jr. Aug. 1983 12 p refs Presented at the Cryog. Eng. Conf. and Intern. Cryog. Mater. Conf., Colorado Springs, 15-19 Aug. 1983
(Contract DE-AC03-76SF-00098)
(DE84-008250; LBL-16535; CONF-830841-32) Avail: NTIS HC A02/MF A01

At a minimum, pulsed field magnets may be used to obtain preliminary qualitative results about superconducting samples. Although the quantitative critical current data is not as reliable as that obtained under steady fields, at high fields there is good agreement between the data. Because of the many factors that play a role, explanation of the degraded critical currents found under pulsed fields at lower applied fields is difficult. Given the current state of theory, much further investigation is needed to clarify the precise causes of this effect and its generality to other superconductors. Pulsed field magnets are effectively used to direct the design process, thus allowing steady field testing facilities to be reserved for testing the more promising materials. DOE

N84-25493# Brown Boveri Electric, Inc., Colmar, Pa.
DEVELOPMENT OF A SOLID-STATE CIRCUIT BREAKER CONCEPT
R. D. Garzon Dec. 1983 34 p refs
(Contract W-7405-eng-26)
(DE84-009110; ORNL/Sub-81-61623/1) Avail: NTIS HC A03/MF A01

There is need for a reliable and economical, high-voltage, high-power circuit breaker that is capable of reducing the arc energy during fault-current interruption, and thus, reducing contact erosion and extending the required maintenance of the contacts. A design concept using solid-state diodes in combination with synchronously operated mechanical switches offers one possibility of meeting this need. The proposed concept is described and the results of the experimental program that was conducted to evaluate the practical feasibility of such a circuit breaker are examined. DOE

N84-25494# Brookhaven National Lab., Upton, N. Y. Physics Dept.
SUPERSYMMETRIC STATISTICAL MODELS ON THE LATTICE
Yonathan Shapir 1983 23 p refs Presented at the Workshop on Supersymmetry in Phys., Los Alamos, N. Mex., 15-20 Dec. 1983
(Contract DE-AC02-76CH-00016)
(DE84-006758; BNL-34222; CONF-831267-1) Avail: NTIS HC A02/MF A01

SUSY models in statistical mechanics involve spinless fermions and form an ideal laboratory for latticization. Extension of SUSY relations to the lattice may clarify, as well, the question of their validity beyond perturbation theory. A nonlinear approach to lattice SUSY is introduced by the assignment of coupled commuting and anticommuting variables to each lattice site. As a typical example a SUSY dimer Hamiltonian which generates lattice branched polymers configurations was demonstrated. A new SUSY model whose configurations are generated by the Ising super-Hamiltonian is suggested. These configurations are not simply related to the high temperatue expansion of the random field Ising model. The critical behavior of the random field model is probably in the nonperturbative regime with thermal fluctuations squeezed into anti d-dimensional manifolds in the boundaries of frozen domains. Self consistent dimensional reduction yields anti d = (d + 1/nu)/2 if (ALPHA) < 0 and anti d = d - 1/nu if (ALPHA) > 0. This may be explained in terms of anomalous anticommuting dimensions. DOE

N84-25495# Delaware Univ., Newark. Dept. of Electrical Engineering.
TRANSPORT PROPERTIES OF AMORPHOUS SILICON-GERMANIUM ALLOY FILMS. VOLUME 2: APPENDICES Final Report, 1 Sep. 1979 - 31 Dec. 1982
Edward A. Fagen, David P. Galley, Jorge L. Garcia-Colevatti, Pritpal Singh, and Scott Wiedeman 1983 335 p refs 2 Vol.
(Grant DE-FG02-79ER-10536)
(DE84-006879; DOE/ER-10536/3-Vol-2) Avail: NTIS HC A15/MF A01

The basic optical and electrical properties of hydrogenated amorphous Si/sub x/Ge/sub 1-x/ alloy films in the range 0 less than or equal to x less than or equal to 0.46 were studied. The alloys were deposited by the plasma decomposition of silane-germane mixtures with doping performed by the introduction of AsH3,PH3 or B2H6 into the plasma. The interband absorption edge and temperature dependence of the dc conductivity were measured as functions of composition and doping level. The optical bandgap increases with Si content in accord with previous workers. This may or may not be a linear function. Substitutional doping of the amorphous alloys of both n- and p-type was achieved. Room temperature conductivity changes of three orders of magnitude were produced with gas phase doping levels of 500 vppM of B2H6 in 46% Si films. The corresponding change in activation energy is over 300 MeV. Contaminants, especially oxygen, appear to sharply reduce the doping efficiency of these alloys. DOE

N84-25496# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
DETECTION OF EXPANSION AT LARGE ANGLE GRAIN BOUNDARIES USING ELECTRON DIFFRACTION
R. W. Balluffi and P. D. Bristowe Feb. 1984 5 p refs
(Contract DE-AC02-78ER-05002)
(DE84-007889; DOE/ER-05002/39) Avail: NTIS HC A02/MF A01

Lamarre and Sass (LS) (Scripta Metall. 17: 1141(1983) observed a grain boundary electron diffraction effect from a large angle twist boundary which is used to obtain the volume expansion at the grain boundary in a direction normal to it. The case where the intensity from the grain boundary region, is close to lattice reflections on the same element of the boundary diffraction lattice is considered. Analysis of this complex problem show that the simplified model of LS is misleading in this case. DOE

N84-25497# Delaware Univ., Newark. Dept. of Electrical Engineering.
TRANSPORT PROPERTIES OF AMORPHOUS SILICON-GERMANIUM ALLOY FILMS. VOLUME 1: TECHNICAL SUMMARY Final Report, 1 Sep. 1979 - 31 Dec. 1982

Edward A. Fagen, David P. Galley, Jorge L. Garcia-Colevatti, Pritpal Singh, and Scott Wiedeman 1983 151 p refs 2 Vol.
(Grant DE-FG02-79ER-10536)
(DE84-006878; DOE/ER-10536/3-Vol-1) Avail: NTIS HC A08/MF A01

Hydrogenated amorphous alloy films spanning the entire a-(Si,Ge)=H binary system were prepared by dc and RF plasma decomposition of monosilane (SiH4) and monogermane (GeH4) mixtures diluted in hydrogen. Growth rates and solid/gas beneficiation ratios are determined as a function of composition and adjustable deposition parameters. Optical bandgap is found to vary linearly with composition between 1.03 and 1.76 eV, in qualitative accord with prior investigations. Dark conductivity measurements indicate a mixture of extended-state conduction and localized-state conduction at 300(0)K. At elevated temperatures extended-state conduction dominates and conventional Fermi-level analysis are applied. The conductivity activation energy of undoped dc-deposited films increases monotonically with Si content. Steady-state photoconductivity measurements reveal pronounced differences between surface and volume response. An alternative explanation of sublinear intensity dependence is offered in terms of transport-mediated competition between bimolecular surface recombination and monomolecular volume recombination. DOE

N84-25498# Oak Ridge National Lab., Tenn. Solid State Div.
THEORETICAL STUDY OF NEUTRON SCATTERING CROSS SECTIONS IN SEMICONDUCTORS
J. F. Cooke, J. A. Blackman (Reading Univ.), and T. Morgan (Reading Univ.) Jan. 1984 20 p refs Presented at the Workshop on High Energy Excitations in Condensed Matter, Los Alamos, Calif., 13 Feb. 1984
(Contract W-7405-eng-26)
(DE84-007540; CONF-840264-1-Draft) Avail: NTIS HC A02/MF A01

The development of high-flux high-energy pulsed-neutron sources makes it possible to study electronic transitions in solids which are in the electron volt range. A theoretical study was carried out to determine the feasibility of using such sources to obtain information about the band structure of semiconductors. Calculations of the inelastic neutron scattering cross sections for germanium and silicon based on an empirical pseudopotential description of the energy bands were completed. No significant structure associated with the band gap was found in the calculational results. The calculated cross sections also were found to be quite small for realistic experimental conditions. Measurement of these relatively small cross sections could, however, provide important information about the band structure of semiconductors which is not obtained from most other experimental techniques. DOE

N84-25499# Louisiana State Univ., Baton Rouge. Dept. of Physics and Astronomy.
STUDIES ON SUB-MICRON DEVICES WITH EMPHASIS ON MOS SYSTEMS Final Report, 1 Jul. 1983 - 30 Jun. 1984
R. F. OConnell 1984 19 p refs
(Contract DE-AS05-79ER-10459)
(DE84-010029; DOE/ER-10459/46) Avail: NTIS HC A02/MF A01

As part of the theoretical studies of Faraday rotation and ellipticity in MOS (metal-oxide-semiconductor) systems, the effects due to the metal gate and due to multiple reflections within both the oxide layer and the semiconductor were investigated. Some preliminary work on the influence of memory effects on the basic model was carried out. A comparison with the first reported observational results of Faraday rotation in a MOS system was made. While a measure of agreement between theory and observation was obtained, it is clear that there are serious discrepancies existing, which will require further analysis. For the past few years the author was working on a comprehensive review entitled Distribution Functions in Physics: Fundamentals, in collaboration with Professor E. P. Wigner (whose seminal paper in 1932 introduced the first distribution function), Professor M. O. Scully and Dr. M. Hillery. This review, which was a prodigious task, is now completed and accepted for publication in Physics Reports. DOE

N84-24634*# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
GROWTH OF CRYSTALS FROM SOLUTIONS IN LOW GRAVITY (A0139A)
M. David Lind and Kjeld F. Nielsen (Technical Univ. of Denmark) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 8-10 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20B

N84-24686*# Martin Marietta Labs., Baltimore, Md.
STUDY OF FACTORS DETERMINING THE RADIATION SENSITIVITY OF QUARTZ CRYSTAL OSCILLATORS (A0189)
John D. Venables and John S. Ahearn *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 173-175 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 20L

N84-24840# Alberta Research Council, Edmonton (Canada). Oil Sands Research Dept.
APPLICATION OF THE FINITE ELEMENT METHOD TO STUDY CRYSTAL GROWTH Abstract Only
Birbal Singh and Robert R. Gilpin (Alberta Univ.) *In* Delaware Univ. Abstr. of the 20th Ann. Meeting, Society of Engineering Science, Inc. 1983 p 11 (For primary document see N84-24833 15-31)
Avail: NTIS HC A16/MF A01 CSCL 05/1

N84-25418# Middle East Technical Univ., Ankara (Turkey). Dept. of Metallurgical Engineering.
APPLICATION OF REGULAR ASSOCIATED SOLUTION MODEL TO THE LIQUIDUS CURVES OF THE Sn-Te AND Sn-SnS SYSTEMS
Huerman Eric *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 3 Dec. 1982 p 277-298 refs (For primary document see N84-25411 15-70)
Avail: NTIS HC A05/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-25500 National Physical Lab., Teddington (England). Div. of Materials Applications.
A CRITICAL ASSESSMENT OF THERMODYNAMIC DATA FOR THE Ca-Mg SYSTEM
D. D. Gohil, V. G. Rivlin, and T. G. Chart Dec. 1983 22 p refs (NPL-DMA(A)-73; ISSN-0143-7314) Copyright. Avail: Issuing Activity

Thermodynamic and phase diagram data for the liquid and solid phases of the calcium-magnesium system were critically assessed. An optimized set of thermodynamic parameters which are consistent with the phase diagram were provided. The Redlich/Kister formalism was employed. Missing values were estimated. The calculated phase equilibria and selected thermodynamic values are compared with those determined experimentally. Author

N84-25501# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
JOURNAL OF ENGINEERING THERMOPHYSICS (SELECTED

ARTICLES)
M. Ge and Z. Fang 7 Feb. 1984 24 p Transl. into ENGLISH from Gongcheng Rewuli Xuebao (China), v. 3, No. 4, 1982 p 323-333
(AD-A139070; FTD-ID(RS)T-1883-83) Avail: NTIS HC A02/MF A01 CSCL 20/13

An isentropic reference line and two partial derivatives with fixed enthalpy were used to establish the extrapolation formulas for rocket engine performance parameters. When the initial enthalpy value of the propellant, combustion chamber pressure, and nozzle exit pressure began to vary, these formulas can be used to carry out extrapolating calculations for specific thrust, characteristic velocity, nozzle area ratio, combustion chamber thermodynamic parameters, and nozzle exit thermodynamic parameters. The formulas are simple and easy to use. The accuracy is high. GRA

N84-25502# Chicago Univ., Ill. Dept. of Chemistry.
TOPICS IN FINITE TIME THERMODYNAMICS
1984 11 p
(Contract DE-AC02-80ER-10646)
(DE84-009057; DOE/ER-10646/3) Avail: NTIS HC A02/MF A01

The scientific topics of principal concern are: (1) principles of optimized heat engines; (2) availability and dissipation for finite time systems; (3) finite time processes doing chemical work; and (4) zero work controls of energy using systems. M.A.C.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-25503 International Inst. for Applied Systems Analysis, Laxenburg (Austria).
DECISION SUPPORT FOR INNOVATION MANAGEMENT: APPLICATION TO THE LIGHTING INDUSTRY
Heinz-Dieter Haustein and Mathias Weber Dec. 1983 75 p refs (IIASA-RR-83-29; ISBN-3-7045-0058-5) Copyright. Avail: Issuing Activity

In today's turbulent economic environment, every decision affecting the development of industry necessarily carries an increased risk that the anticipated economic and social goals will not be achieved. The description of decision making does not always include the notion of risk. Sometimes the volatility of cost factors or changing economies of scale (innovation being the primary reason for the change) are held responsible for uncertainty about future development. These phenomena are also used to explain the decline in capital formation and in decisions to invest that we are currently witnessing. The economic and decision sciences are trying to cope with this situation by devising more sophisticated methods and procedures for supporting decision making. Methods that are applicable to the analysis of innovation patterns, with the aim of basing the necessary decision on more sound easonin are reviewed. The application of some of these methods to innovation management in the lighting industry are described. Author

N84-25504# Societe Nationale Industrielle Aerospatiale, Paris (France). Direction Industrielle.
VALUE AND COMPETITION [VALEUR ET COMPETITION]
J. Bultel and R. Tassinari 20 Jun. 1983 11 p In FRENCH
(SNIAS-832-501-101) Avail: NTIS HC A02/MF A01

A Frenchman associates the word value with a costly object of the finest quality. The concept does not bring up the notion of the exchange value which is implied in the American usage of the term. Value to a buyer is based on quality as well as life cycle and operating costs. To the seller, quality and production costs are factors to be considered when determining the marketing price (or value of exchange). Transl. by A.R.H.

N84-25505# Office of the Comptroller of the Army, Washington, D. C. Directorate of Cost Analysis.
NOW: AN INITIAL APPROACH TO COLLECTION OF MAJOR MATERIEL SYSTEMS ACTUAL COSTS
D. Philips and M. Carson Oct. 1983 22 p
(AD-A139845; DCA-P-98) Avail: NTIS HC A02/MF A01 CSCL 05/1

This paper presents an approach that in the foreseeable future could provide a significant percentage of major Army systems' life cycle actual (historical) costs. Also presented are procedures that could be implemented now to collect/derive a significant portion of those costs. This approach was tested on three Selected Acquisition Report (SAR) systems. The test procedures and results are included. Author (GRA)

N84-25506# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES. VOLUME 38, NUMBER 4
L. E. Shaffer Apr. 1984 72 p
(AD-A140039; ESN-38-4) Avail: NTIS HC A04/MF A01 CSCL 05/2

Partial contents: Behavioral Sciences; Biological Sciences; Computer Sciences; Earth Sciences; Material Sciences; Ocean Sciences; Physics; Science Policy; and Space Science. GRA

N84-25507# Naval Academy, Annapolis, Md.
SUMMARY OF RESEARCH, ACADEMIC DEPARTMENTS, 1982-1983 Annual Report, Jul. 1982 - Jun. 1983
W. L. Heflin Oct. 1983 256 p
(AD-A140059; USNA-AR-8) Avail: NTIS HC A12/MF A01 CSCL 05/2

This annual report summarizes the research work of the Naval Academy faculty and midshipmen for the period July 1982 through June 1983. Sponsored and independent research projects are listed by title, followed by the names of the investigators and an abstract. A list of publications and their abstracts are included as well as presentations at professional meetings, conferences, and seminars. Author (GRA)

N84-25508# Office of the Comptroller of the Army, Washington, D. C. Directorate of Cost Analysis.
RESULTS OF A RESEARCH STUDY TO IDENTIFY HISTORICAL RDTE (RESEARCH, DEVELOPMENT, TEST AND EVALUATION) OBLIGATIONS AND EXPENDITURES ON MAJOR ARMY MATERIEL AND NON-MATERIEL SYSTEMS
D. Philips and M. Carson Oct. 1983 102 p
(AD-A139328; DCA-P-97) Avail: NTIS HC A06/MF A01 CSCL 05/1

Results are given of a research study to determine the ability of the current Research, Development, Test and Evaluation (RDTE) Project Numbers to identify RDTE costs of major Army materiel and non-materiel systems from the Army's finance and accounting data. Also included are three alternative architectures which were developed to examine ways to improve historical cost data collection. The results of the study support an initial hypothesis that the project numbers, as currently defined, do not identify the total RDTE costs of major Army systems, but they can identify a significant portion of those costs. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-25509# RAND Corp., Santa Monica, Calif.
CLARIFY: AN ON-LINE GUIDE FOR REVISING TECHNICAL PROSE
Mary E. Vaiana, Norman Shapiro, and Mark LaCasse Nov. 1983 62 p refs
(N-2037-RC) Avail: NTIS HC A04/MF A01

This Note describes the development and testing of CLARIFY, a computerized writing aid designed at the Rand Corporation to assist writers in revising technical prose. CLARIFY is not a traditional readability formula; its design reflects research on how English speakers go about the task of understanding sentences. CLARIFY flags sentences that have certain patterns of nominalizations, prepositional phrases, and forms of the verb to be. The choice of these features reflects research which suggests that the dominant strategy employed by English speakers in interpreting sentences is the assumption of a subject-verb-object (SVO) structure. The features that CLARIFY flags are good surrogate indicators that a sentence does not have an SVO structure, and therefore that the initial interpretive strategy will be unsuccessful. In developing CLARIFY, various patterns of these features were tested and user comments about the system's usefulness and effectiveness were obtained. B.W.

N84-25510*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PUBLICATIONS OF THE JET PROPULSION LABORATORY 1982
15 Sep. 1983 26 p Sponsored by NASA
(NASA-CR-173539; JPL-BIBL-39-24; NAS 1.26:173539) Avail: NTIS HC A03/MF A01 CSCL 05B

A bibliography of articles concerning topics on the deep space network, data acquisition, telecommunication, and related aerospace studies is presented. A sample of the diverse subjects include, solar energy remote sensing, computer science, Earth resources, astronomy, and satellite communication. M.A.C.

N84-25511# Japan Broadcasting Corp., Tokyo. Auditory and Visual Science Research Div.
A CONSIDERATION ON THE CAPABILITY OF RECEIVING CHARACTER-INFORMATION
Tadahiko Fukuda Jan. 1984 12 p refs
(NHK-SERIAL-294) Avail: NTIS HC A02/MF A01

The human capability of receiving character information, and of the factors restricting this capability were studied. It is shown that the capability indicted by the span of immediate memory is limited by the average number of characters in words made up of individual characters, and calculated in terms of information content, and there is no difference between different kinds of character. Differences in memory span caused by the size of the pattern presented are negligible. Differences in the way character are arranged produces differences in how the span of memory is saturated. This phenomenon is explained by the lateral interference effect between adjacent characters. E.A.K.

N84-25512# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SIRIUS: BIBLIOGRAPHIC SEARCH AND RETRIEVAL SYSTEM [SIRIUS: SISTEMA DE PESQUISA E RECUPERACAO BIBLIOGRAFICA]
Enivaldo Freire doOFilho, Ubirajara Moura deFreitas, Vilma Leal Siqueira, Celia Regina Tavares daSilva, Marciana Leite Ribeiro, and Hulda Olail deC.R.Alves Jun. 1983 19 p ref In PORTUGUESE; ENGLISH summary Presented at the 20th Brazilian Congr. of Library Sci. and Documentation, Balneario Camboriu, Brazil, 23-28 Oct. 1983
(INPE-2771-PRE/344) Avail: NTIS HC A02/MF A01

An on-line system developed and implemented at INPE may be accessed to obtain bibliographic data through the arguments such as author, title, descriptor and series; as well as to obtain up-dated circulation information about a certain material and/or user. The query language is constructed of the following commands: MOSTRE: lists the arguments with the same radical; DEFINA: creates and combines sets of references; VERIFIQUE: lists and/or removes references of a set; IMPRIMA: prints a set; NOMES: furnishes the relation of the defined sets; USUARIO: states the present situation of a user in relation to loads and reservations; MATERIAL: informs the availability of some material for load; SOS: helps the user to handle the query language. This bibliographic retrieval system that was developed for the B 6800 Burroughs can be adapted to other computers. Author

N84-25513# Stuttgart Univ. (West Germany). Inst. fuer Statik und Dynamik fer Luft- und Raumfahrtkonstruktionen.
INTERACTIVE CREATIONS AND MODIFICATION OF CHINESE CHARACTERS
Ingolf Grieger, Guenter Wagemann, and Guangmao Wu 1982 28 p refs
(ISD-299; ISSN-0170-6071) Avail: NTIS HC A03/MF A01

There is a collection of graphics subroutines named BASIC INGA available. These subroutines are used for the development of new application functions which can then be integrated into the INGA system in the EXTRA part for all additional user-defined operations. The generation and modification of Chinese characters is reported. These functions show nicely the generality of the INGA system. The first version of the Chinese Character Creator (CCC) was ready on a refresh vector display with light pen in September 1981. The onversion of the program to a raster display with locator has led to the simulation of picking by a locator which is an important new feature in the INGA system. Author

N84-25514# Research Inst. of National Defence, Linkoeping (Sweden).
DATA BASE DEPENDENT AGGREGATION OPERATORS IN A MAP ORIENTED INFORMATION SYSTEM
Eva Toller and Erland Jungert Dec. 1983 24 p refs
(Grant STU-83-3307)
(FOA-C-30347-E1; ISSN-0347-3708) Avail: NTIS HC A02/MF A01; Research Institute of National Defence, Stockholm KR 50

Aspects of a map oriented information system are described. Aggregation operators, intended for subqueries used in more complex data base queries that demand great computational efforts are outlined. The operators are the relationships between the objects of the data base on which the operators should operate. The practical aspects concerning the building of a data base for test purposes is outlined and the complete map information system is reviewed. E.A.K.

N84-25515# Research Inst. of National Defence, Stockholm (Sweden). Dept. 53.
WHAT'S DOMAIN SKILL? FRAMES IN INFORMATION SEEKING
Lena Linde Jan. 1984 25 p refs Sponsored by the Swedish Work Environment Fund
(FOA-C-53014-H2; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

The form and content of information in long term memory (knowledge) are discussed. Issues relating to acquisition and retrieval processes are surveyed. Special attention is paid to so called frame representations. It is argued that frame or schema organized knowledge, has a constraining function. Lack of knowledge may have the consequence of being stuck with either too many or no alternatives in short-term memory during information search. A frame system framework should be used as a conceptual tool to understand cognitive processes during information-seeking and decision making in computerized environments. Examples are provided from an experiment with a textual database. Author

N84-25516# Research Inst. of National Defence, Stockholm (Sweden).
A GEOGRAPHIC INFORMATION SYSTEM FOR FOREST MANAGEMENT
Ek Bengt and Anders Wellving Feb. 1984 35 p refs In SWEDISH; ENGLISH summary
(FOA-C-20531-D8; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

A computer system, called RSAW, for the storage, analysis and presentation of geographic information with grid structure was developed. Each feature of the terrain (e.g., height of trees, soil material) is processed and plotted separately. The system presents thematic maps on areas with any combination of the features that are stored. The potential use of this system for forest management is studied. The study compares the RSAW system and the conventional way where the forest is presented as a number of stands where all features are homogeneous. It is indicated that the RSAW has a good resolution and high flexibility. However, routines for the mapping of suitable management units should be developed and photointerpretation of high accuracy is recommended. E.A.K.

N84-25517# University of Southern California, Marina del Rey.
THE MOSIS (MOS IMPLEMENTATION) SYSTEM (WHAT IT IS AND HOW TO USE IT) Technical Manual
Mar. 1984 69 p
(Contract MDA903-81-C-0335)
(AD-A139744; ISI/TM-84-128) Avail: NTIS HC A04/MF A01 CSCL 09/2

The purpose of this document is to provide a general description of the MOSIS (MOS Implementation System) system, and list detailed instructions with examples of how to use MOSIS. The MOSIS system provides online instructions to users. This document, however, is addressed to prospective new users and contains information on: what the service offers; how the service works; how to interact with MOSIS; how to become an authorized MOSIS user; and how circuit designs are submitted, processed, and tracked. This document includes step-by-step illustrations of information retrieval from MOSIS and step-by-step illustrations of design submittals to MOSIS. The MOSIS User Manual (as of 1 Mar. 1984) is also included in this document. GRA

N84-25518# CACI, Inc., Arlington, Va. Systems Requirements and Development Dept.
RESULTS OF DEMONSTRATION OF JRIM PROTOTYPE DATA BASE Final Technical Report, 2 May 1983 - 24 Feb. 1984
24 Feb. 1984 13 p
(Contract DCA100-83-C-0049)
(AD-A139772) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report provides an overview of the procedures employed in developing the Joint Requirements Integration Management (JRIM) Office prototype data base to support the integration of Resource Unit Monitoring (RUM) and Conventional Planning and Execution (CPE) functional requirements and the relating of those requirements to existing automated information processing systems. The prototype data base was developed using Problem Statement Language/Problem Statement Analyzer (PSL/PSA). This report reviews the development of the real-world and PSL/PSA models that depict the data base relationships, and references earlier technical reports that discuss in detail the derivation of the RUM and CPE functions (and subfunction) and associated data classes that the primary media for manipulating the data base. Earlier technical reports also furnished by JRIMO staff with a Standards and Conventions Manual (techniques and procedures) for maintaining the data base as well as a simplified Users Manual and Help Guides that further assist users in acquiring a familiarity with the prototype data base. In conjunction with this effort, a formal users course and a formal technical (maintenance/operation of prototype) course, each of one week duration, were provided. Course attendees received appropriately detailed training material. Author (GRA)

N84-25519# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics/Logistics Dept.
EXPANDING THE PERMANENT FILE DIRECTORY ON THE CDC (CONTROL DATA CORPORATION) NOS/BE (NETWORK OPERATING SYSTEM/BATCH ENVIRONMENT) OPERATING SYSTEMS Final Report
R. L. Yearick Apr. 1983 20 p
(AD-A140005; DTNSRDC/CMLD-83-09) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report documents a solution to the limited size of the permanent file base on the Control Data Corporation computers running the NOS/BE (Network Operating System/Batch Environment) operating system. The CDC permanent file concept, and modifications made to the standard operating system are explained. These modifications have increased the number of permanent files allowed for the default permanent file set, and also improved the response time for all permanent file functions. Author (GRA)

N84-25520# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
DISTRIBUTED AND DECENTRALIZED CONTROL IN FULLY DISTRIBUTED PROCESSING SYSTEMS Final Technical Report, 1 Jul. 1980 - 30 Jun. 1981
T. G. Saponas Nov. 1983 211 p
(Contract F30602-78-C-0120; AF Proj. R244)
(AD-A140120; GIT-ICS-81/18-F; RADC-TR-83-239) Avail: NTIS HC A10/MF A01 CSCL 09/2

An essential component of a Fully Distributed Processing System (FDPS) is the distributed and decentralized control. This component unifies the management of the resources of the FDPS and provides system transparency to the user. In this dissertation the problems of distributed and decentralized control are analyzed and fundamental characteristics of an FDPS executive control are identified. Several models of control have been constructed in order to demonstrate the variety of resource management strategies available to system designers and provide some insight into the relative merits of the various strategies. The performance of four control models has been analyzed by means of simulation experiments. GRA

N84-25521# Sandia Labs., Albuquerque, N. Mex. Technical Library Reference Div.
GERMAN-ENGLISH TECHNICAL GLOSSARY
Patricia E. Newman Dec. 1983 40 p
(Contract DE-AC04-76DP-00789)
(DE84-007978; SAND-83-2575) Avail: NTIS HC A03/MF A01

Translations from German into English yield many new words that have not yet found their way into the dictionaries. This glossary includes primarily words encountered in the physical sciences, solar and nuclear energy, and electronics. It is intended for use by anyone who is translating or reading a recent article in German in those fields. DOE

N84-25522# California Univ., Berkeley. Lawrence Berkeley Lab.
PROCEEDINGS OF THE 2ND INTERNATIONAL WORKSHOP ON STATISTICAL DATABASE MANAGEMENT
Roy Hammond and John L. McCarthy 1983 431 p refs Workshop held at Los Altos, Calif., 27-29 Sep. 1983
(Contract DE-AC03-76SF-00098)
(DE84-005866; LBL-16321; CONF-830950) Avail: NTIS HC A19/MF A01

The purpose of this workshop is to bring together statisticians and computer scientists, statistical database system users and system builders, to exchange ideas on statistical data base management, statistical analysis, and the present recognized problems that current data management and statistical software do not fully address. The proceedings are published prior to the Workshop so that they can: (1) report research results and work in progress; (2) provide an intellectual introduction to most of the workshop participants; (3) provide a point of departure for working group discussions. DOE

N84-25523# California Univ., Livermore. Lawrence Livermore Lab. Nuclear Criticality Information System Div.
TECHNOLOGY INFORMATION SYSTEM: TRANSCRIPT OF TYPICAL DEMONSTRATION
Tina D. McGowan 12 Mar. 1984 62 p
(Contract W-7405-eng-48)
(DE84-009082; UCID-20032) Avail: NTIS HC A04/MF A01

A transcript is given of a typical demonstration of the National Criticality Information Systems. DOE

N84-25524# Argonne National Lab., Ill. Computing Services Div.
GUIDE TO REPORTING TIME IN THE FINANCIAL INFORMATION SYSTEM AT ANL
Miriam E. Bretscher, Jerry L. Butler, and Larry J. Skelley Mar. 1984 58 p
(Contract W-31-109-eng-38)
(DE84-009356; ANL/TM-414) Avail: NTIS HC A04/MF A01

Operation of a new system for the full cost recovery service centers of the Laboratory report employee time, whether the time is charged to another organization or to an internal function are described. Most service centers of the laboratory report employee time to the financial information system (FIS) via time cards or timesheets, which are routed to the Data Entry group of the administrative data processing operation where the time records are keyed. With this new system, the service center assumes primary responsibility for the keying and management of time charges. The system provides these benefits to the service center: a choice of processing period and month end boundary, printed timesheets with history of charges by employee, prevalidation of charges, thus fewer rejected charges, and computer readable file of current and prior charges for analysis. The controller's office plans to implement the time reporting system on a division by division basis until most service centers assume responsibility for their time charges. DOE

N84-25409# Middle East Technical Univ., Ankara (Turkey).
QUERY EXECUTION IN THE DISTRIBUTED RAP DBM SYSTEMS
A. U. Tansel and E. A. Oezkarahan *In its* Middle East Technical Univ. J. of Pure and Appl. Sci., Vol. 15, No. 2 Aug. 1982 p 126-160 refs (For primary document see N84-25406 15-70)
Avail: NTIS HC A06/MF A01

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-25525# International Trade Administration, Washington, D.C. Industry Analysis Div.
COMPETITIVE ASSESSMENT OF THE U.S. CIVIL AIRCRAFT INDUSTRY Final Report
Mar. 1984 192 p refs
(PB84-154913) Avail: NTIS HC A09/MF A01 CSCL 05C

The future international competitiveness of the U.S. civil aircraft industry is examined in terms of its principal businesses: large transport, commuter, business and helicopter aircraft. There is no single view of how the U.S. large transport aircraft business may fare in the 1990s in competition with the European Airbus and a potential, independent entry from Japan. U.S. international competitiveness depends on the performance of an interaction among an array of economic, market and technological variables. The United States does not have an independent entry in the larger commuter aircraft market, a market whose size continues to grow. Future U.S. international competitiveness in this business is expected to remain weak. U.S. business aircraft and helicopter businesses are challenged by strong foreign competition, and imports now account for a significant share of the U.S. market.
GRA

N84-25591*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SAMICS: ENGINEERING/ECONOMIC MODEL TO PREDICT COSTS
In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 8-9 (For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 05C

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-25526# Committee on Science and Technology (U. S. House).
THE 1985 NASA AUTHORIZATION
Washington GPO 1984 82 p Hearing before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 2d Sess., no. 69, 9 Feb. 1984
(GPO-31-453) Avail: Subcommittee on Transportation, Aviation and Materials

Budget requirements and appropriations for NASA research programs are examined. Current structures, aerodynamics, propulsion systems, flight controls, rotorcraft, and high performane aircrft research projects are discussed with particular emphasis on cost effectiveness and technological advancement. M.A.C.

N84-25527# Committee on Science and Technology (U. S. House).
ARCTIC RESEARCH AND POLICY ACT OF 1983
Washington GPO 1984 496 p Hearing before the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 56, 28 Jun. 1983
(GPO-171) Avail: Subcommittee on Science, Research and Technology

Although approximately 15 Federal agencies are involved in ad hoc research in the Arctic, there is no comprehensive data base on which to base decisions of immense financial and strategic consequences. A bill creating an Arctic Science Policy Council and an Arctic Reseach Commission is discussed which authorizes an annual expenditure of 25 million for surveying existing research undertakings in both the public and private sectors, establishing a clearing house for nonproprietary and unclassified research data, and making research grants to fill gaps in knowledge of the Arctic. A.R.H.

N84-25528# Committee on Armed Services (U. S. House).
TECHNOLOGY TRANSFER
Washington GPO 1984 297 p refs Hearings before the Technol. Transfer Panel of the Comm. on Armed Services, 98th Congr., 1st Sess., 9, 21, 23 Jun.; 13-14 Jul. 1983
(H-Rept-98-15; GPO-27-827) Avail: Committee on Armed Services

The problem of unequal technology transfer between the United States and the U.S.S.R. is discussed with particular emphasis on the National Security of the United States and the economic impact of the information flow. Trade control lists such as the Militarily Critical Technology List (MCTL) are examined and associated trade control strategies are discussed. Specific industries such as the computer and semiconductor equipment industries are examined.
M.A.C.

N84-25529# Committee on Science and Technology (U. S. House).
FUTURE OF AERONAUTICS
Washington GPO 1984 144 p Hearings before the Subcomm. on Transportation, Aviation and Mater. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., no. 52, 5 Dec. 1983
(GPO-29-744) Avail: Subcommittee on Transportation, Aviation and Materials

Topics relevant to the long term research and development goals for aeronautics are discussed. Subjects include general information on certain NASA and DOD projects, civil aviation, vertical takeoff aircraft, aircraft control systems, aircraft construction materials, and aerodynamic configurations through computer aided design. Current developments in civil aviation as well as future

research plans are outlined by representatives of the aviation industry. M.A.C.

N84-25530# Committee on Appropriations (U. S. House).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATION BILL, 1985
Washington GPO 1984 78 p A bill referred to the Committee on Appropriations, 98th Congr., 2nd Sess., 1984
Avail: US Capitol, House Document Room

The provisions of the bill making appropriations for the Department of Housing and Urban Development, and for sundry independent agencies, boards, commissions, corporations, and offices are described. The various agencies include NASA, EPA, the Council on Environmental Quality, the National Science Foundation, the Consumer Product Safety Commission, Department of the Treasury, the Veterans Administration, and others. For individual titles, see N84-25531 through N84-25531.

N84-25531# Committee on Appropriations (U. S. House).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Dept. of Housing and Urban Develop.-Independent Agencies Appropriation Bill, 1985 1984 p 33-38 Washington GPO (For primary document see N84-25530 15-84)
Avail: US Capitol, House Document Room

The appropriations for the National Aeronautics and Space Administration are described. The research and development account includes funding for the space station and various programs involving the application of space capabilities in remote sensing of land resources, ocean and atmospheric conditions; materials processing; and communications. In the area of space science it includes projects designed to explore the solar system and expand man's knowledge of the universe. Also included under this heading are development programs involving aeronautics technology which support the civilian and military capability of the United States in the area of airframe and engine manufacturing. M.G.

N84-25532# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS ACT, 1985
Washington GPO 1984 53 p H. R. 5713 enacted into law by the 98th Congr., 2nd Sess., 5 Jun. 1984
Avail: US Capitol, Senate Document Room

The text of an act making apropriations for the department of housing and urban development and sundry independent agencies, boards, commissions, corporations, and offices for the fiscal year ending September 30, 1985 is given. Money is appropriated for rent supplements, housing counseling Solar Energy and Energy Conservation Bank, urban Homesteading, American Battle Monuments, Commission, the Consumer Product Safety Commission, the Environmental Protection Agency, and other agencies and programs. For individual titles, see N84-25533 through N84-25533.

N84-25533# Committee on Appropriations (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION RESEARCH AND DEVELOPMENT
In its Dept. of Housing and Urban Develop.-Independent Agencies Appropriations Act, 1985 1984 p 22-26 Washington GPO (For primary document see N84-25532 15-84)
Avail: US Capitol, Senate Document Room

The text for an act making appropriations for NASA programs and activities for the fiscal year ending September 30, 1985 is given. Construction, maintenance, research and development, space stations, the Gamma Ray Observatory, the Space Telescope, the Venus radar mapper mission, and the Galileo mission are funded. Money is also appropriated for the National Science Foundation and the National Credit Union Administration. R.J.F.

N84-25534# Department of Energy, Washington, D. C. Office of Small and Disadvantaged Business Utilization.
REPORT TO CONGRESS ON THE SMALL BUSINESS PROGRAM OF THE DEPARTMENT OF ENERGY
Jan. 1984 44 p
(DE84-009107; DOE/MA-0106/1) Avail: NTIS HC A03/MF A01

On January 5, 1983, the Department of Energy accepted a 10% increase in its Small and Disadvantaged Business goal. The Office of Small and Disadvantaged Business Utlization was designated to implement and coordinate departmental plans and actions to carry out the President's minority business contracting initiatives. Annual minority business enterprise development plans must be developed. The total procurements award to all small businesses in FY 1983 was 22.1% ($2.2 billion). DOE

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-25535# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ELECTRIC VEHICLE MODELING AND SIMULATION
A. R. DeWispelare Aug. 1983 80 p
(AD-A139719; AD-E401117; AU-AFIT-EN-TR-83-4) Avail: NTIS HC A05/MF A01 CSCL 13/6

The forecasting of the performance of electric vehicles has revealed many discrepancies when compared to actual test data. An electric vehicle computer simulation program was developed to ameliorate this deficiency. The approach was to establish a very comprehensive and flexible vehicle model and simulate its operation on a realistic driving cycle. The driving cycle selected was the Federal Urban Driving Sequence. A thorough vehicle model was established that incorporates aerodynamic drag, rolling asistance, both rotational and translational inertial effects, and component by component dynamic power train efficiencies. Battery discharge performance is tracked by a fractional-utilization algorithm with corrections for short-term discharge effects. The simulation compares required power obtained from the driving cycle speed schedule and vehicle model characteristics with the available power at the motor for each time increment of the driving cycle to compute battery fraction used and deviation from the speed schedule when available power is insufficient. These results of the simulation can be used to evaluate an existing vehicle's performance or, if desired, to develop vehicle parameters to obtain a specified performance level. An application of the program to develop a suburban passenger vehicle is included to demonstrate the simulation's utility. A test bed vehicle was constructed and tested to verify the simulation. Additional aspects such as microprocessor based controllers including implementation of an optimal control law were investigated to gain insight into the efficiency and performance trade-offs of such a system. GRA

N84-25536# Los Alamos Scientific Lab., N. Mex.
ASSESSMENT OF FUEL CELL PROPULSION SYSTEMS
J. H. Altseimer, J. A. Frank, D. H. Nochumson, G. R. Thayer, A. M. Rahm (Los Alamos Resources Management Systems, Inc., Colts Neck, N.J.), K. D. Williamson, Jr., R. W. Hardie, and S. V. Jackson Nov. 1983 196 p refs
(Contract W-7405-eng-36)
(DE84-006323; LA-9954-MS) Avail: NTIS HC A09/MF A01

The applicability of fuel cells to a wide variety of transportation vehicles and was assessed competing propulsion systems were compared. The assessments include economic evaluations and noneconomic evaluations. Research and development areas to support the development of fuel cell systems are recommended. It is indicated that fork lift trucks are an excellent application for fuel cells. Fuel cell use in urban delivery vans and city buses is promising because it would reduce air pollution. Fuel-cell-powered

automobiles, pickup trucks, and intercity buses only look promising over the long term. DOE

N84-25537# Argonne National Lab., Ill. Chemical Technology Div.
SYSTEM/BATTERY DESIGN INTERACTION FOR A LITHIUM-METAL SULFIDE VAN BATTERY
Albert A. Chilenskas 1983 22 p refs Presented at the EHV Systems Assessment Seminar, Gainesville, Fla., 14 Dec. 1983
(Contract W-31-109-eng-38)
(DE84-007274; CONF-831272-1) Avail: NTIS HC A02/MF A01

A conceptual van battery design based upon system inputs from the Chrysler T-Van Project and an ANL/Toyota Study has been completed. A van battery consisting of 162 Li-Alloy/FeS cells would meet the requirements for range, acceleration, and payload specified by EPRI. Considerable engineering work remains in developing reliable battery modules and battery components for such a battery. A van battery program, funded by EPRI and supported by DOE studies, has been initiated. DOE

N84-25538# Argonne National Lab., Ill.
USE OF THE Li-Al/FeS BATTERY IN ADVANCED VEHICLE PROPULSION SYSTEMS
A. A. Chilenskas and N. P. Yao 1984 15 p Presented at the Vehicle Propulsion Symp., Indianapolis, 20 Mar. 1984
(Contract W-31-109-eng-38)
(DE84-007275; CONF-840390-1) Avail: NTIS HC A02/MF A01

The lithium/molten salt system provides for a family of batteries with lithium as the electrochemically active element and a molten salt mixture containing lithium as the electrolyte. The basic concept of the Li-Al/FeS battery is given, and its status is compared to aqueous batteries and other advanced couples. Research work on more energetic couples such as Li-Si, FeS2, and pure lithium is also underway. Ongoing programs are summarized, one of which involves an electrified Chrysler T-van that uses a Li-Al/FeS battery. DOE

N84-25539# California Univ., Livermore. Lawrence Livermore Lab.
ESTIMATE OF THE CONSUMER COST OF ALUMINUM FUEL FOR ELECTRIC VEHICLES
John F. Cooper 22 Feb. 1984 17 p refs Presented at the 2nd Intern. Workshop on Reactive Metal-Air Batteries, Palo Alto, Calif., 1 May 1982
(Contract W-7405-eng-48)
(DE84-008327; UCRL-90468; CONF-8205249-1) Avail: NTIS HC A02/MF A01

The cost of aluminum fuel to the vehicle owner is estimated in view of technical developments and price increases in aluminum ingot since 1979. The estimate is based on the US Industry Published Price for distributed 50-lb ingot. This price is then increased by the costs of fabrication, alloying agents, premium purity, and service station (retail) markups derived by analogy to gasoline. A credit for recycled hydrargillite is also estimated, although actual return is speculative. A critical assumptin is the energy yield of the aluminum, as measured by the vehicular fuel efficiency. The current distribution system for aluminum is briefly described, and the retail markups for gasoline are tabulated. DOE

88 SPACE SCIENCES (GENERAL)

N84-25540# Ceskoslovenska Akademie Ved, Brno. Astronomical Inst.
STELLAR SPECTRA AND THEIR INTERPRETATION. 1ST CONFERENCE OF THE SUBCOMMISSION NO. 2
I. Hubeny, ed. and B. Onderlicka, ed. 1981 45 p refs Conf. held in Brno, Czechoslovakia, 8-12 Jun. 1981
Avail: NTIS HC A03/MF A01

Topics concerning astrophysics, stellar evolution, and stellar spectrum analysis are examined. Subjects include spectroscopic analysis of stellar atmospheres, stellar modeling, line spectra in turbulent media, radiative transfer, temperature and gravitational effects on stellar atmospheres, and specific spectroscopic characteristics of several stars and star systems. For individual titles, see N84-25541 through N84-25556.

N84-25541# Academy of Sciences, Potsdam (East Germany). Zentralinst. fuer Astrophysik.
MEAN DEPTHS OF LINE FORMATION Abstract Only c89
Ernst-August Gussmann *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 1-2 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

A straightforward reasonable physical definition of a mean depth is effected by means of the expectation value used in mathematical statistics. The real atmosphere is replaced by a fixed layer situated at the mean depth of line formation from which the observed intensity or flux emerges. Applied to the emergent line depression it is not possible to define a fixed depth but a thickness of an absorbing layer forming the absorption line. These two values have a different physical meaning and must not be confused with one another. The mean depth is calculated approximately by taking the arithmetic mean of the depths weighted with the absorption along the path outwards. This immediately leads to the well known Eddington/Barbier method. M.A.C.

N84-25542# Academy of Sciences, Potsdam (East Germany). Zentralinstitut fuer Astrophysik.
LINE FORMATION IN TURBULENT MEDIA Abstract Only c89
Juergen Stahlberg *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 3-4 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

The methods of mean field electrodynamics are used to investigate the influence of stochastic velocity fields on line formation. Due to numerical difficulties in such concepts, only two point correlations are taken into account. But there are some difficulties: Different models can yield different profiles - for the same parameter - or vice versa, a different interpretation of the same profile can yield different correlation lengths and also different velocities. Care is required in interpreting these parameters as real hydrodynamics ones. M.A.C.

N84-25543# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
PARTIAL FREQUENCY REDISTRIBUTION IN SUBORDINATE LINES Abstract Only c89
Petr Heinzel *In its* Stellar Spectra and Their Interpretation 1981 p 5-6 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

An appropriate laboratory-frame redistribution function (LFR) subordinate lines formed in stellar atmospheres and solar prominences is presented under the assumption of a Maxwellian velocity distribution for the lower state atoms. Starting from quantum mechanical results. A LFR is obtained for the case of radiative broadening of both levels. One general routine that can be used to evaluate all is R sub IS. M.A.C.

N84-25544# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
RADIATIVE TRANSFER IN ROCHE COORDINATES Abstract Only c89
Petr Hadrava *In its* Stellar Spectra and Their Interpretation 1981 p 7-8 ref (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

The global geometery of the atmosphere is mostly assumed to be plane parallel (with a few exceptions of spherical models). There are observable effects (e.g., the gravitational darkening in binaries) caused by distortion of stars. The influence of a more general geometry (namely Roche's) on radiative transfer is treated approximately and the equations are presented and explained. M.A.C.

N84-25545# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
GRAVITO-MAGNETIC ORIGIN OF THE TEMPERATURE OF A STELLAR CORONA **c89**
Chvojkova Eliska Woyk *In its* Stellar Spectra and Their Interpretation 1981 p 9-13 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

Cosmic magnetodynamics is studied from the point of view of the variation of the pitch angle i with the distance from the gravity centre r in dependence on the mean particle velocity - defined by E sub 1 of (2) - and on the local field variation defined by n. Characteristic particle path phenomena occurring with a high degree of probability after each collision, are regarded as characteristic features of the whole investigated part of athe plasma. Reliable conclusions about the plasma cannot be drawn without large experience of particle path behaviour under most varying conditions. M.A.C.

N84-25546# Konkoly Observatory, Budapest (Hungary).
SOME PROBLEMS IN CALIBRATING UBV PHOTOMETRY FOR EFFECTIVE TEMPERATURE AND SURFACE GRAVITY Abstract Only **c35**
Szabolcs Barcza and S. Szilagyi *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 14-16 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

The spectrophotometry of 54 A/B stars and of the RR Lyrae variable SU Dra was reduced to the recent recalibration of Vega. By integrating the reduced spectrophotometric results the colors of these stars were calculated. A plot of the computed versus directly observed color indices forms a 45 deg line if b-y is considered. This suggests that the spectrometry, the uvby sensitivity functions and the absolute calibration of vega are correct. However the U-B, B-V data cannot be fitted to a 45 deg line; there are systematic discrepancies. This suggests that at least two of the U, B, V sensitivity functions need further revision and the absolute calibration of UBV colors may contain a systematic error exceeding 10%. The UBV light curve of SU Dra in terms of hydrostatic and radiative equilibrium and LTE model atmospheres were interpreted. M.A.C.

N84-25547# Warsaw Univ. Observatory (Poland).
ANALYSIS OF MgII LINES IN ALGOL **c64**
Henryk Cugier *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 17-20 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

Algol, Data Persei, is a well known triple system, which consists of the eclipsing variable, Algol C revolving around the barycenter of the triple system with a period of about 2 years. The observational material consists of a sequence of 19 spectral scans of MgII resonance lines during the primary eclipse of Algol. Algol A is the main source of radiation in the investigated spectral range. Synthetic spectra were calculated for different phases of the eclipse, taking into account the rotation of Algol A. Local Thermal Equilibrium (LTE) analysis indicates that a model of the atmosphere corresponding to a normal star of spectral type B8 V allows a good overall description of the spectrum. The LTE theory of line formation does not descraibe all details of the line profiles, especially, in the central part of the MgII resonance lines. The observed lines are much deeper than the calculated ones. M.A.C.

N84-25548# Crimean Astrophysical Observatory (USSR).
A MODEL ATMOSPHERE ANALYSIS OF THE Am STAR 68 TAU Abstract Only **c90**
Leonid S. Lyubimkov *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 21 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

Using model atmospheres high dispersion spectrograms of the Am star 68 Tau are analyzed. Values of effective temperature, surface gravity and microturbulent velocity were obtained. Constancy of microturbulence in the atmosphere is discussed. The abundances of 24 elements were found. Metals are overabundant, with overabundance increasing towards heavier elements. Calcium and scandium abundances are close to the solar ones. The deficiency of Ca and Sc is typical only for relatively cool Am stars. Mass, radius, luminosity and age of the star were found using evolutionary calculations. The hydrogen burning in the core of 68Tau is finished already and the star is beginning to evolve toward the red-giant branch. M.A.C.

N84-25549# Purkyne Univ., Brno (Czechoslovakia). Astronomical Inst.
PROBLEMS IN THE SPECTROSCOPY OF COOL CARBON STARS Abstract Only **c89**
Miroslav Vetesnik *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 22-23 (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

The observational problems connected with the spectroscopical observations of the cool carbon stars are discussed. The main difficulty arises from the fact that almost all these stars are apparently weak objects spectroscopically attainable only in the case when special observational improvements are imployed. Also the high intensity gradients of their spectra, caused by strong continuous molecular absorptions in the short wavelength regions, make the observation very difficult because the effect does not allow to expose the whole spectrum all at once. Author

N84-25550# Tartu Astronoomia Observatooriumi (USSR).
SYNTHETIC SPECTRA OF RED GIANTS Abstract Only **c89**
Liia F. Hanni and J. Sitska *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 24-25 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

A computer program was developed for the calculation of the synthetic spectra of cool stars. The basic input data for the program are the model atmosphere, atomic and molecular line data, line broadening parameters and abundances of elements. The usefulness of the synthetic spectrum approach for the determination of Li abundances in cool stars was briefly discussed. Author

N84-25551# Purkyne Univ., Brno (Czechoslovakia). Astronomical Inst.
SPECTRAL ANALYSIS OF BETA PEGASI Abstract Only **c89**
Miroslav Vetesnik *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 26 (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

A method allowing to analyze late type spectra exhibiting strong effects of line blending was developed. Using a minimizing procedure it compares the observed profiles of the spectrum with the theoretical ones described by the parameters of the line positions, their depths and line broadenings. The procedure well separates the individual lines of the complex spectra crowded with absorption features but fails in cases when the level of the continuous background is unknown. For this reason an attempt was made to fix the continuum using the curve of growth for the spectral lines well defined in the spectrum given. Author

N84-25552# Ceskoslovenska Adademie Ved, Ondrejov. Astronomical Inst.
ON THE ORIGIN OF Be PHENOMENON **c89**
Svatopluk Kriz and P. Harmanec *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 27-29 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

There are three competitive hypothesis present which try to explain the Be phenomenon: (1) rotational hypothesis which assumes that Be stars are rotationally unstable at the equator and shed the matter which forms a disk-shaped envelope producing the observed emission lines; (2) The hypothesis of radial outflow of matter due to radiation pressure; (3) The binary hypothesis accepts the quasi-axisymmetrical geometry of the envelope but

supposes that the disk-shaped envelope originates due to the mass transfer from the secondary component. B.G.

N84-25553# Slovak Academy of Sciences, Tatranska Lomnica (Czechoslovakia). Astronomical Inst.
V 505 MONOCEROTIS: NEW BINARY SHELL STAR Abstract Only **c89**
Drahomir Chochol *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 30-31 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

The variability of the radial velocity of the star HD 48 914 (V 505 Mon) was discovered. The amplitude is 0.5 mag. and period shorter than one day. Eggen made photometric observations during 80 nights in the years 1975 to 76 and found only small light variations of 0.15 mag. In the spectrogram with a dispersion of 1.7 nm/mm, taken by the 2 m telescope at Ondrejov on January 31, 1981 a strong emission in H (sub alpha) was discovered. Two emission peaks are wel separated by an absorption core. This feature indicates that the star is a typical shell stars. Spectral and luminosity classification based on the visibility and intensities of important lines for classification such as CII 3919-21, 4267, NII 3995, He I 4121, 4144 gave B3 III. The star belongs to luminosity class II to III. Author

N84-25554# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
A COMPUTER PROGRAM FOR CALCULATING NON-LTE MODEL STELLAR ATMOSPHERES **c61**
Ivan Hubeny *In its* Stellar Spectra and Their Interpretation 1981 p 32-35 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

A brief description of the computer program TLUSTY for calculating non-LTE plane-parallel model stellar atmospheres in hydrostatic and radiative equilibrium is presented. A discussion of the basic physical concepts and an explicit formulation of the relevant equations is given. A highly coupled system of non-linear integro-differential equations of radiative transfer, and hydrostatic, radiative, and statistical equilibria, is solved by the complete linearization method. Out computer code is similar to that of Mihalas et al. (1975), however with a number of important modifications. An effort was made to extend a region of calculated non-LTE model stellar atmospheres for O and B stars. Author

N84-25555# Warsaw Univ. Observatory (Poland).
MODEL STELLAR ATMOSPHERE AND SPECTRUM COMPUTATIONS WITH MINICOMPUTER **c61**
Jerzy Madej *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 36-38 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

A brief description of two computer programs (ATM7 and LINE), designed for the theoretical investigation of plane-parallel static model stellar atmospheres and spectrum synthesis on the LTE level is given. Both of them were tested and are used with a PDP 11/45 minicomputer or equivalent, with no reference to its external memory during computations. The programs require 32K words in the central memory, each word consisting of 16 bits, but sometimes they are organized in overlay form. Author

N84-25556# Purkyne Univ., Brno (Czechoslovakia). Nicolaus Copernicus Observatory and Planetarium.
COMPUTER PROGRAMS FOR PROCESSING OF SPECTRA Abstract Only **c61**
Zdenek Pokorny *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 39-40 (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

A package of five computer programs for the processing of spectra was developed. These programs are intended for the processing of absorption spectra with high resolution, containing many lines. The first program (labeled as NEKTAR) makes the initial inspection of a spectrum. This procedure is necessary for the correct run of the subsequent programs. The second program (OPIUM) determines the coefficients of the calibration curve. The fast Fourier transform technique is applied to the spectral data in order to remove the noise. Using the third program (LABYRINT) one obtains a filtered, but not to the continuum reduced spectrum. The fourth program (MAGIE) serves to determine the continuum level. Moreover, this program is able to sum up to four spectra and determine a more precise dispersion relation than that used in the previous program. The fifth program (SABAT) determines the equivalent widths of the spectral lines by means of several different methods. Author

N84-25557# Max-Planck-Institut fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
[ACTIVITIES REPORT OF THE INSTITUTE OF EXTRATERRESTRIAL PHYSICS] Annual Report [INSTITUT FUER EXTRATERRESTRISCHE PHYSIK - JAETIGKEITSBERICHT 1983]
Jan. 1984 118 p refs In GERMAN Original contains color illustrations
(MPE-181; ISSN-0173-699-X) Avail: NTIS HC A06/MF A01

Activities in the area of extraterrestrial physics are reported. The experiments are conducted in the upper Earth atmosphere. Investigations are conducted by balloons, rockets, satellites and space probes. Investigations are performed in three different methods: (1) in situ outerspace measurements; and (3) laboratory measurements. E.A.K.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-25558 Royal Observatory, Edinburgh (Scotland).
CATALOGUE OF STELLAR ULTRAVIOLET FLUXES. A COMPILATION OF ABSOLUTE STELLAR FLUXES MEASURED BY THE SKY SURVEY TELESCOPE (S2/68) ABOARD THE ESRO SATELLITE TD-1
G. I. Thompson, K. Nandy, C. Jamar (Liege Univ.), A. Monfils (Liege Univ.), L. Houziaux (Mons Univ.), D. J. Carnochan (University College, London), and R. Wilson (University College, London) 1978 474 p refs Sponsored by the Belgian Services Programmation de la Politique Scientifique and the UK Science and Engineering Research Council
Copyright. Avail: Issuing Activity

The absolute ultraviolet fluxes in four pass bands (centered at 2740A, 2365A, 1965A, and 1565A) for 31,215 stars are displayed. Data were generated from observations by the Ultraviolet Sky Survey Telescopy (S2/68) aboard the ESRO satellite TD-1. The stars were selected subject to the constraint that the signal to noise ratio was at least 10.0 in any one of the four passbands. Interstellar reddening (extinction) and stellar color are discussed. Standard error figures accompany the absolute flux data. R.S.F.

N84-25559*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LHEA CONTRIBUTIONS TO THE FUTURE OF ULTRAVIOLET ASTRONOMY BASED ON SIX YEARS OF IUE RESEARCH
Richard F. Mushotzky and C. M. Urry (MIT) Apr. 1984 15 p refs Meeting held in Greenbelt, Md., 3-5 Apr. 1984 Submitted for publication
(NASA-TM-86098; NAS 1.15:86098) Avail: NTIS HC A02/MF A01 CSCL 03A

Astronomical models of galactic nuclei emission spectra are reassessed in light of ultraviolet and X-ray spectroscopic observations. Spectral analysis of BL Lacertae objects using data collected by the International Ultraviolet Explorer (IUE) and other astronomical observatories is presented. For individual titles, see N84-25560 through N84-25561.

N84-25560*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ULTRAVIOLET AND X-RAY OBSERVATIONS OF ACTIVE

GALACTIC NUCLEI: CONSTRAINTS ON MODELS OF THE BROAD EMISSION LINE REGION
Richard F. Mushotzky *In its* LHEA Contrib. to the Future Ultraviolet Astron. Based on Six Years of IUE Res. Apr. 1984 p 1-9 refs (For primary document see N84-25559 15-89)
Avail: NTIS HC A02/MF A01 CSCL 03A

Many active galactic nuclei, in particular quasars and Seyfert I's, are characterized by strong, broad emission lines from permitted transitions in abundant elements. In the simplest models, these lines ofriginate in clouds located at some characteristic distance from the central ionizing source in a quasi-spherical distribution. Ultraviolet and X-ray spectroscopic data gathered from the International Ultraviolet Explorer (IUE), HEAO 1, and HEAO 2 are utilized herein to further define and refine the photoionization models of the broad emission line region (BLR) of these galactic nuclei. Parameters including X-ray spectra, X-ray absorption, ultraviolet spectra, hydrogen cloud geometry, cosmic dust, cloud metallicity, and continuous spectra are considered. The luminosity of galactic nuclei is also discussed. R.S.F.

N84-25561*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VERY RECENT IUE OBSERVATIONS OF 2 BL LACERTAE ORBITS
C. M. Urry, Y. Kondo, K. R. H. Hackney, R. L. Hackney (Western Kentucky Univ.), S. L. Mufson (Indiana Univ.), and W. Wisniewski (Arizona Univ.) *In its* LHEA Contrib. to the Future Ultraviolet Astron. Based on Six Years of IUE Res. Apr. 1984 p 10-13 refs (For primary document see N84-25559 15-89)
Avail: NTIS HC A02/MF A01 CSCL 03A

Spectroscopic observations of two BL Lacertae objects consisting of 2 spectra of 1218+304 and 12 spectra of MrK 421 are presented. Data were generated by the International Ultraviolet Explorer (IUE) and HEAO 1. The former BL object was never before observed with IUE, possibly because it is very faint, but the fact that it is an X-ray source, and a highly variable one, makes it particularly interesting. MrK 421 was observed many times before with IUE as part of a continuing monitoring program. The present observations indicate an intensity decrease of approximately 25% on a timescale of one month, with little or no associated spectral change. With one exception, the spectra of these two BL objects show no discrete features, and the continua are well fit by the power law models. The one exception is a long exposure of MrK 421 which showed a broad emission feature near 1580 A. The validity of this feature is not yet established. R.S.F.

N84-25562*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A HARDWARE/SOFTWARE SIMULATION FOR THE VIDEO TRACKING SYSTEM OF THE KUIPER AIRBORNE OBSERVATORY TELESCOPE
Glenn A. Boozer (Boozerco), Darrell D. McKibbin, Michael R. Haas (Mycol, Inc.), and Edwin F. Erickson Feb. 1984 36 p refs
(NASA-TM-85896; A-9662; NAS 1.15:85896) Avail: NTIS HC A03/MF A01 CSCL 03A

This simulator was created so that C-141 Kuiper Airborne Observatory investigators could test their Airborne Data Acquisition and Management System software on a system which is generally more accessible than the ADAMS on the plane. An investigator can currently test most of his data acquisition program using the data computer simulator in the Cave. (The Cave refers to the ground-based computer facilities for the KAO and the associated support personnel.) The main Cave computer is interfaced to the data computer simulator in order to simulate the data-Exec computer communications. However until now, there has been no way to test the data computer interface to the tracker. The simulator described here simulates both the KAO Exec and tracker computers with software which runs on the same Hewlett-Packard (HP) computer as the investigator's data acquisition program. A simulator control box is hardwired to the computer to provide monitoring of tracker functions, to provide an operator panel similar to the real tracker, and to simulate the 180 deg phase shifting of the chopper squre-wave reference with beam switching. If run in the Cave, one can use their Exec simulator and this tracker simulator. B.W.

N84-25563# European Space Agency, Paris (France).
AN ATLAS OF UV SPECTRA OF SUPERNOVAE
P. Benvenuti, L. SanzFernandezdeCordoba (Instituto Nacional de Tecnica Aeroespacial, Madrid), W. Wamsteker, F. Macchetto (ESTEC, Noordwijk, Netherlands), G. C. Palumbo (CNR, Bologna), N. Panagia (CNR, Bologna), and Bruce Battrick, ed. Dec. 1982 224 p refs Origina contains color illustrations
(ESA-SP-1046; ISSN-0379-6566) Avail: NTIS HC A10/MF A01; ESA, Paris FF 140, Member States, AU, CN and NO (+20% others)

The International Ultraviolt Explorer (IUE) was the first space UV telescope able to observe a supernova event and follow it during its luminosity decline. This was made possible not only by the sensitivity of the instrument, but also by the observatory-like mode of operation, which allows quick reaction to the announcement of a supernova discovery. Indeed in the case of SN 1982b the first spectroscopic observation after its discovery was obtained by IUE, which on that occasion also provided an accurate positional fix for the supernova with respect to the nucleus of the parent galaxy NGC 2268. To date, six supernovae were observed with IUE and a summary of the observations is reported. The Atlas presented here consists of an observing log, photographs of the spectra (coded in false color), plots and flux tables: a detailed description of these contents is given. Author

N84-25564# Helsinki Univ. of Technology, Espoo (Finland). Radio Lab.
CRYOGENIC 75-95 GHz FRONT-END FOR THE METSAEHOVI RADIO TELESCOPE
Antti V. Raeisaenen, Arto O. Lehto, and Robert Lamb 1983 26 p refs
(Rept-S-145; ISBN-951-752-982-1; ISSN-0355-5712) Avail: NTIS HC A03/MF A01

A cryogenic Schottky mixer from-end for 75 to 95 GHz was built for radioastronomical observations with the Metsaehovi 13.7 m telescope. The measured DSB receiver noise temperature is 80 to 140 k over the whole frequency range. The practical design and construction work of the front-end, and also the performance of the receiver both in the laboratory and on the telescope are described. Author

N84-25541# Academy of Sciences, Potsdam (East Germany). Zentralinst. fuer Astrophysik.
MEAN DEPTHS OF LINE FORMATION Abstract Only
Ernst-August Gussmann *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 1-2 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25542# Academy of Sciences, Potsdam (East Germany). Zentralinstitut fuer Astrophysik.
LINE FORMATION IN TURBULENT MEDIA Abstract Only
Juergen Stahlberg *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 3-4 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25543# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
PARTIAL FREQUENCY REDISTRIBUTION IN SUBORDINATE LINES Abstract Only
Petr Heinzel *In its* Stellar Spectra and Their Interpretation 1981 p 5-6 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25544# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
RADIATIVE TRANSFER IN ROCHE COORDINATES Abstract Only
Petr Hadrava *In its* Stellar Spectra and Their Interpretation 1981

p 7-8 ref (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25545# Ceskoslovenska Akademie Ved, Prague. Astronomical Inst.
GRAVITO-MAGNETIC ORIGIN OF THE TEMPERATURE OF A STELLAR CORONA
Chvojkova Eliska Woyk *In its* Stellar Spectra and Their Interpretation 1981 p 9-13 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25549# Purkyne Univ., Brno (Czechoslovakia). Astronomical Inst.
PROBLEMS IN THE SPECTROSCOPY OF COOL CARBON STARS Abstract Only
Miroslav Vetesnik *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 22-23 (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25550# Tartu Astronoomia Observatooriumi (USSR).
SYNTHETIC SPECTRA OF RED GIANTS Abstract Only
Liia F. Hanni and J. Sitska *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 24-25 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25551# Purkyne Univ., Brno (Czechoslovakia). Astronomical Inst.
SPECTRAL ANALYSIS OF BETA PEGASI Abstract Only
Miroslav Vetesnik *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 26 (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25552# Ceskoslovenska Akademie Ved, Ondrejov. Astronomical Inst.
ON THE ORIGIN OF Be PHENOMENON
Svatopluk Kriz and P. Harmanec *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 27-29 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

N84-25553# Slovak Academy of Sciences, Tatranska Lomnica (Czechoslovakia). Astronomical Inst.
V 505 MONOCEROTIS: NEW BINARY SHELL STAR Abstract Only
Drahomir Chochol *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 30-31 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-25565*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MATTER ANTIMATTER DOMAINS: A POSSIBLE SOLUTION TO THE CP DOMAIN WALL PROBLEM IN THE EARLY UNIVERSE
A. K. Mohanty (Maryland Univ.) and F. W. Stecker May 1984 19 p refs Submitted for publication
(NASA-TM-86100; NAS 1.15:86100) Avail: NTIS HC A02/MF A01 CSCL 03B

An SU(5) grand unified theory model is used to show how the degeneracy between vacua with different spontaneously broken charge parity can be dynamically lifted by a condensate of heavy fermion pairs. This drives a phase transition to a unique vacuum state with definite charge parity. The transition eliminates the domain walls in a matter antimatter symmetric domain cosmology. Author

N84-24660*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
INTERSTELLAR-GAS EXPERIMENT (A0038)
Don L. Lind, Johannes Geiss (Bern Univ.), and Fritz Buehler *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 98-100 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24668*# Office National d'Etudes et de Recherches Aerospatiales, Toulouse (France).
ATTEMPT AT DUST DEBRIS COLLECTION WITH STACKED DETECTORS (A0138-2)
J. C. Mandeville *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 124-126 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24671*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTERPLANETARY DUST EXPERIMENT (A0201)
S. Fred Singer (Virginia Univ.), John E. Stanley (Virginia Univ.), Philip C. Kassel, Jr., and J. J. Wortman (North Carolina Univ.) *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 134-135 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24672*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE DEBRIS IMPACT EXPERIMENT (S0001)
Donald H. Humes *In its* Long Duration Exposure Facility (LDEF) Feb. 1984 p 136-137 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-25548# Crimean Astrophysical Observatory (USSR).
A MODEL ATMOSPHERE ANALYSIS OF THE Am STAR 68 TAU Abstract Only
Leonid S. Lyubimkov *In* Ceskoslovenska Akademie Ved Stellar Spectra and Their Interpretation 1981 p 21 refs (For primary document see N84-25540 15-88)
Avail: NTIS HC A03/MF A01

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

N84-25566*# Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
MAGNETIC PROPERTIES OF MARTIAN SURFACE MATERIAL Final Technical Report, 16 Sep. 1982 - 15 Sep. 1983
Robert B. Hargraves 1984 3 p
(Contract NAGw-372)
(NASA-CR-173491; NAS 1.26:173491) Avail: NTIS HC A02/MF A01 CSCL 03B

The hypothesis that the magnetic properties of the Martian surface material are due to the production of a magnetic phase in the clay mineral nontronite by transient shock heating is examined. In the course of the investigation a magnetic material is produced with rather unusual properties. Heating from 900 C to 1000 C, of

natural samples of nontronite leads first to the production of what appears to be Si doped maghemite gamma (-Fe2O3). Although apparently metastable, the growth of gamma -Fe2O3 at these temprtures is unexpected, and its relative persistence of several hours at 1000 C is most surprising. Continued annealing of this material for longer periods promote the crystallization of alpha Fe2O3 and cristobalite (high temperature polymorph of SiO2). All available data correlate this new magnetic material with the cristobalite hence our naming it magnetic ferri cristobalite. Formation of this magnetic cristobalite, however, may require topotactic growth from a smectite precursor. M.A.C.

N84-25567*# National Aeronautics and Space Administration, Washington, D. C.
ADVANCES IN PLANETARY GEOLOGY
May 1984 421 p refs
(NASA-TM-86247; NAS 1.15:86247) Avail: NTIS HC A18/MF A01 CSCL 03B

A wide variety of topics on planetary geology are presented. Subjects include stratigraphy and geomorphology of Copernicus, the Mamers valle region, and other selected regions of Mars and the Moon. Crater density and distribution are discussed for Callisto and the lunar surface. Spectroscopic analysis is described for Europa and Ganymede. For individual titles, see N84-25568 through N84-25582.

N84-25568*# University of Northern Illinois, De Kalb. Dept. of Geology.
THE CRUSTAL TECTONICS AND HISTORY OF EUROPA: A STRUCTURAL, MORPHOLOGICAL, AND COMPARATIVE ANALYSIS M.S. Thesis
Paul M. Schenk *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 3-112 refs (For primary document see N84-25567 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

An evaluation of surface features and structures on the Galilean moon Europa is made using the available high resolution Voyager imagery, low resolution support imaging, and what understanding of ice structure and mechanical behavior science has that is applicable to the problem. A general discussion of the history of Europa studies and the fundamental global morphology is undertaken. The visible lineament and terrain patterns are described, and possible origins discussed. Observations of faulting and block rotation previously described are amplified. A comparison of Europa's structures to terrestrial sea ice and lava lake crust features is also included. Finally, an attempt is made at synthesizing a unified model for the evolution of Europa's crust is presented which is compared with models developed by others. M.A.C.

N84-25569*# Southern Connecticut State Coll., New Haven.
ANALYSIS OF PERMAFROST DEPTHS ON MARS
Gennaro H. Crescenti *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 115-132 refs (For primary document see N84-25567 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The Martian surface thermal characteristics as they effect the thickness and distribution of the permafrost are discussed. Parameters such as temperature mean, maximum, and minimum, heat flow values, and damping depths are derived and applied to a model of the Martian cryosphere. A comparison is made between the permafrost layers of Earth and Mars. M.A.C.

N84-25570*# Tennessee Univ., Knoxville. Dept. of Geological Sciences.
SPECTRAL ANALYSIS OF GROOVE SPACING ON GANYMEDE
Robert E. Grimm *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 133-135 refs (For primary document see N84-25567 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The technique used to analyze groove spacing on Ganymede is presented. Data from Voyager images are used determine the surface topography and position of the grooves. Power spectal estimates are statistically analyzed and sample data is included. M.A.C.

N84-25571*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
STRATIGRAPHY OF THE CRATER COPERNICUS
Rita Paquette *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 137-148 refs (For primary document see N84-25567 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The stratigraphy of copernicus based on its olivine absorption bands is presented. Earth based spectral data are used to develop models that also employ cratering mechanics to devise theories for Copernican geomorphology. General geologic information, spectral information, upper and lower stratigraphic units and a chart for model comparison are included in the stratigraphic analysis. M.A.C.

N84-25572*# Boston Univ., Mass. Dept. of Geology.
GEOLOGIC OBSERVATIONS OF THE MARTIAN HIGHLAND BOUNDARY IN THE MAMERS VALLES REGION
James H. Persky *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 149-151 refs (For primary document see N84-25567 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

A geologic map of the Ismenius Lacus (MC-5) Southwestern subquadrangle of Mars is described, using the 1:2,000,000 photomosaic as a base. The mapping, and a limited study of the surrounding areas, was done to determine the nature and origin of fretted terrain, fretted channels, and the northern highland scarp. Some highlights resulting from the mapping and accompanying topical investigations are included. M.A.C.

N84-25573*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SOURCE OF MANGALLA VALES
Cerchard Edmund Pfau (Wayne State Univ., Detroit) and R. Stevens Saunders *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 153-156 refs (For primary document see N84-25567 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Through the use of high resolution Viking topographic data, a hypothesis for the formation of Mangalla Vales is presented. Subsurface water flow and concurrent lava flow are used to explain the theory of a catastrophic flood that created the network of channels. A thorough description of the terrain is included. M.A.C.

N84-25574*# Arizona Univ., Tucson. Lunar and Planetary Lab.
SPATIAL DISTRIBUTION OF CRATERS ON THE MOON AND CALLISTO
Alex Ruzicka and Robert G. Strom *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 157-159 refs (For primary document see N84-25567 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The spatial distribution of craters 8 km diameter on an area of Callisto are compared with that of a lunar highlands area from which craters are removed to produce the Callisto size/frequency distribution. Craters in the lunar area are mapped and classified according to degradational type using the five-fold LPL scheme where Class 1 is the freshest and Class 5 the most degraded. The size/frequency distribution are determined and compared with the Callisto area. Craters are removed according to the stage of degradation. Its crater population is basically a production population deficient in large craters relative to that of the terrestrial planets. This indicates that the population of impacting objects responsible for the period of heavy bombardment in the inner solar system was different from that at Jupiter, and probably had a different origin as well. M.A.C.

N84-25575*# Arizona Univ., Tucson. Lunar and Planetary Lab.
CALLISTO: A LUNAR-LIKE BOMBARDMENT?
Alex Ruzicka *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 160-166 refs (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

Voyager spacecraft imagery of the Galilean satellites in 1979 revealed Callisto and portions of Ganymede to be densely cratered, but nonetheless deficient in craters larger than 30 km relative to the cratered highlands of the Moon, Mars, and Mercury. This relative deficiency of large craters could have been due to the complete obliteration of large craters through viscous relaxation in the icy surfaces of Ganymede and Callisto at a time when their surfaces were presumably warmer and more mobile or the deficiency could have stemmed from a relative depletion of large impacting bodies in the Jupiter system, compared with the terrestial planets. To test which alternative is correct, and, specifically, to see whether Callisto was subjected to a lunar-like bombardment, two areas on the heavily cratered lunar farside were compared with an area on Callisto. It was concluded that the Moon and Callisto must have bombarded by two different populations and though viscous relaxation could have modified, or even completely obliterated, craters on Callisto's surface, it could not hve been solely responsible for the observed deficiency of large craters on Callisto relative to the moon. R.J.F.

N84-25576*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

L CHONDRITE METEORITES: A COMPILATION AND PRELIMINARY ANALYSES

Alan Silliman *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 167-171 refs (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

A compilation of those meteorites currently recognized as being L chondrites, exclusive of the numerous Antarctica finds, was made and is known as the L Chondrite Register. Data for these 576 meteorites was collected from a variety of sources, primarily the British Museum's Catalogue of Meteorites and the Appendix to the Catalogue of Meteorites. Also used was the Revised Cambridge Chondrite Compendium, which provided a convenient listing of L chondrites; other sources include Chinese Meteorites, Meteorites, by Wasson (1974), and the Meteoritical Bulletin of Meteoritics. This last source provided data for most recent falls and was referenced through March of 1982. All such data were recorded on a computer data file with a HP 2647A terminal, so that information could easily be retrieved and manipulated. For each meteorite, the petrographic class, location of find, fall date and hour, mass, mole per cent fayalite, weight per cent Fe, SiO2/MgO ratio, shock class, metal class, 4He abundance, UTh-H3 gas retention age, K-Ar gas retention age, and 21Ne cosmic ray exposure age, was recorded when known. R.J.F.

N84-25577*# Toledo Univ., Ohio. Dept. of Geology.

THE CRATER DENSITY OF A LINEAR FEATURE

Lawrence Spong *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 172-179 refs (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

The standard method of crater counting presently employed permits determination of the relative ages of areal geologic features on cratered planets and satellites. A new method is presented which calculates the areal density of the craters superposed upon linear features. The method produces an effective synthetic area around the linear feature for each crater bin size, permitting the line counts to be compared directly with standard area counts. The shape of the synthetic area produced by the method is an oval, with the calculation of this area for each in being dependent on the median crater size for that bin, as well as the length and width of the linear feature. Incorporated into the method's equation is a factor to normalize the count to one million square kilometers for each bin. Because of the dependence of the method on the crater sizes, the largest possible number of bins should be counted for the method to be the most effective. R.J.F.

N84-25578*# National Aeronautics and Space Administration, Washington, D. C.

NITROGEN THRESHOLD EXPERIMENT

Cheryl L. Treat *In its* Advan. in Planetary Geol. May 1984 p 180-204 (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

In order to obtain data on Earth geologic processes associated with wind erosion, Mar's and Venus' atmospheres were simulated. Experiments were designed to observe the effects of pressure, gravity, and density on sand movement. An experiment designed to test the operator variance was a comparative test between nitrogen and carbon dioxide. Pressure and therefore density was increased until threshold was noted. Threshold was determined at precisely the same densities of the two gases. If viscosity were a contributing factor in grain saltation the effect would be noted at low pressures. The experiment showed no such variance between carbon dioxide and nitrogen runs for low pressure (density). The largest difference in viscosity between carbon dioxide and nitrogen occurs at low pressures (densities). R.J.F.

N84-25579*# Geological Survey, Flagstaff, Ariz.

THE GEOLOGY OF THAUMASIA-NORTHEAST QUADRANT

Marlene F. Tuesink *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 205-207 refs (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

The northeastern section of Thaumasia is located in the heavily cratered southern highlands of Mars between 30 S and 47.5 S and 67.5 W and 90 W. To the northwest lies the Tharis bulge and to the southeast is the Argyre Basin. Previous mapping in Thaumasia included a geologic map of the entire guadrangel by McGill (1978) at a 1:5,000,000 scale and a map of lava flows in the northwest quadrant by Scott and Tanaka (1981). Most investigations concentrated west of 90 W long. in conjunction with the Tharis volcanics. This investigation was designed to examine the overall geology of this section of Thaumasia. After distinguishing various geomorphical units, a geologic map was made at a scale of 1:2,000,000. Lastly, a general sequence of events was developed for the area. Mapping was done from individual low, medium, and high resolution images from the Viking missions, as well as using a 1:2,000,000 scale photo mosaic of the northeast quadrant of Thaumasia. Amount of cratering and faulting, superposition, differences in morphology, and albedo were used to separate out geomorphologically distinct units. R.J.F.

N84-25580*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PLANET-CROSSING ASTEROID SURVEY

Peter D. Wilder (State Univ. Coll., Geneseo, N.Y.) *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 208-211 (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

The planet-crossing asteroid survey was begun in 1973 in order to study those asteroids which may intersect the orbits of the inner planets. Throughout the history of the survey, many of the various classes of asteroids were investigated. The near-Earth objects including the Apollo, Amor, and Aten families were studied in addition to asteroids whose orbits cross that of Mars, and some objects which are generally confined to the main belt. Observing was done on the 18 inch Schmidt telescope at the Palomar Mtn. Observatory. Typically, two consecutive photographs of a favorable field are taken. The exposure times of the films are usually twenty minutes and ten minutes, respectively. The telescope is guided at sidereal rate, so that asteroids will leave short trailed images. The films are then scanned for trails. By comparing the two films, the direction and approximate rate of motion of an asteroid may be determined. R.J.F.

N84-25581*# Geological Survey, Flagstaff, Ariz. Branch of Astrogeologic Studies.

PRELIMINARY RESULTS OF ALBEDO CORRELATION BETWEEN EUROPA AND GANYMEDE

Sandra E. Yuter *In* NASA, Washington Advan. in Planetary Geol. May 1984 p 212-217 refs (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

Building on the work of Johnson et al (1982) on the multispectral properties of the icy Galilean satellites, Voyager images of Europa and Ganymede were analyzed to determine values for the exponent k of the Minnaert photometric function and preliminary spectra for various regions on the two satellites. The study showed that the k values for the Minnaert function for Ganymede and Europa are different and thus that the photometric behavior of the two bodies is different. This lends evidence to the idea that the physical nature of the surfaces of Ganymede and Europa are dissimilar. It should be noted that the many factors such as texture and roughness, not taken into account in the Minnaert equation, have an effect on the photometric function. Thus, while the spectra do not rule out similar materials occurring on Europa and Ganymede, they do not contribute any evidence to that possibility. R.J.F.

N84-25582*# Kansas State Univ., Manhattan. Dept. of Geology.

THE GEOLOGY OF MARE ACIDALIUM QUADRANGLE MARS M.S. Thesis

Nanci E. Witbeck *In* NASA, Washington Advan. in Planetary Geol. 1982 p 219-374 refs (For primary document see N84-25567 15-91)

Avail: NTIS HC A18/MF A01 CSCL 03B

The Mare Acidalium quadrangle is described. Mare Acidalium quadrangle lies between 30 - 60 N latitude and 0 - 60 W longitude. Materials that were used in mapping the quadrangle include Mariner and Viking single-frame images and photomosaics. Preliminary geologic mapping was done on five 1:2,000,000-scale photomosaics and selected higher resolution photomosaics. The data were then compiled on one sheet at a scale of 1:5,000,000. The Mariner 9 mission revealed a striking planetary dichotomy; high-standing, heavily-cratered terrain in the south that contrasts with low-lying, lightly-cratered terrain in the north. Both of these terrain types occur in Mare Acidalium quadrangle. The boundary separating the elevated cratered plateau from the lower plains is, in many places, an escarpment 1-2 km-high, however, in a few places where there is no escarpment, plains materials embay and overlap the heavily-cratered plateau material. R.J.F.

N84-24669*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

THE CHEMISTRY OF MICROMETEOROIDS (A0187-1)

Friedrich Hoerz, David S. McKay, Donald A. Morrison, Donald E. Brownlee (Washington Univ.), and Robert M. Housley (Rockwell International) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 127-130 (For primary document see N84-24632 15-15)

Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24670*# McDonnell Center for Space Sciences, St. Louis, Mo.

CHEMICAL AND ISOTOPIC MEASUREMENTS OF MICROMETEOROIDS BY SECONDARY ION MASS SPECTROMETRY (A0187-2)

John H. Foote, Patrick D. Swan, Robert M. Walker, Ernst K. Zinner, Dieter Bahr, Hugo Fechtig, Elmar Jessberger, Eduard Igenbergs, Uwe Kreitmayr, Heribert Kuczera et al *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 131-134 refs Prepared in cooperation with Max-Planck-Inst. fuer Kernphysik, Heidelberg and Technische Univ., Munich and Ernst-Mach Inst., Freiburg and Dornier-Werke G.m.b.H., Friedrichshafen (West Germany) (For primary document see N84-24632 15-15)

Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-25583*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ACCELERATION OF RUNAWAY ELECTRONS AND JOULE HEATING IN SOLAR FLARES

Gordon D. Holman May 1984 38 p refs

(Grants NGR-21-002-199; NGL-21-002-033; NsG-5320; NSF ATM-81-03809)

(NASA-TM-86112; NAS 1.15:86112) Avail: NTIS HC A03/MF A01 CSCL 03B

The electric field acceleration of electrons out of a thermal plasma and the simultaneous Joule heating of the plasma are studied. Acceleration and heating timescales are derived and compared, and upper limits are obtained on the acceleration volume and the rate at which electrons can be accelerated. These upper limits, determined by the maximum magnetic field strength observed in flaring regions, place stringent restrictions upon the acceleration process. The role of the plasma resistivity in these processes is examined, and possible sources of anomalous resistivity are summarized. The implications of these results for the microwave and hard X-ray emission from solar flares are examined. Author

N84-25584*# Teledyne Brown Engineering, Huntsville, Ala. Space Programs Div.

RESEARCH IN SOLAR PHYSICS: SOME TECHNIQUES FOR ANALYZING DATA FROM THE ULTRAVIOLET SPECTROMETER AND POLARIMETER Final Report

William Henze, Jr. Apr. 1984 39 p refs

(Contract NAS8-31908)

(NASA-CR-171035; NAS 1.26:171035; SP84-MSFC-2726) Avail: NTIS HC A03/MF A01 CSCL 03B

Useful information for certain aspects of the analysis of data obtained by the Ultraviolet Spectrometer and Polarimeter (UVSP) on the Solar Maximum Mission (SMM) are contained. The meaning of the UVSPCO-ordinate system and the SMM roll, pitch, and yaw are described and the process for overlaying UVSP images is explained. The various computer programs that calculate the line of sight component of the SMM spacecraft velocity from the spacecraft to the Sun is described. The spacecraft velocity is used to correct or interpret the signal observed in USVP dopplergrams. A method of using the spacecraft velocity to calibrate UVSP dopplergrams and magnetograms, i.e., determine the width of the observed emission line is applied. The UVSP polarization analysis procedures are described and the expressions for the statistical uncertainties in various quantities obtained from UVSP measurements are given. Author

N84-25585# Kiruna Geophysical Inst. (Sweden).

OBSERVATIONS OF He+ IONS IN THE SOLAR WIND

N. F. Pissarenko (Academy of Sciences, Moscow), E. M. Dubinin (Academy of Sciences, Moscow), A. V. Zakharov (Academy of Sciences, Moscow), E. Yu. Budnik (Academy of Sciences, Moscow), and R. Lundin Feb. 1984 20 p refs Submitted for publication (KGI-Preprint-064; ISSN-0349-2656) Avail: NTIS HC A02/MF A01

Results obtained from the PROGNOZ-8 ion composition experiment which indicates that He(+) ions may be more abundant in the solar wind than previous measurements have indicated. The experiment has a sufficiently high mass resolution to accurately discriminate between H(+), He(++), He(+) and O(+) ions over the energy range 0.35 to 5.2 keV/e. Furthermore, the fact that the experiment is continuously monitoring in the solar direction means that fairly good statistics can be aquired as well. In a few cases, He(+)/He(++) ratios up to approximately 0.05 were found, but in most cases when He(+) was observed, it was generally of the order 0.3 to 3% of the He(++) content. The results were compared with previous measurements of He(+) ions in the solar wind and discuss also other constituents with M/q=4 as alternative candidates. Finally, a possible explanation for the high He(+) abundance in the disturbed solar wind is given. Author

N84-25586# Tufts Univ., Medford, Mass. Dept. of Physics.

VERY LARGE ARRAY OBSERVATIONS OF SOLAR ACTIVE

REGIONS Interim Scientific Report, 1 Jan. - 30 Dec. 1983
K. R. Lang 30 Jan. 1984 77 p
(Grant AF-AFOSR-0019-83; AF Proj. 2311)
(AD-A139287; AFOSR-84-0157TR) Avail: NTIS HC A05/MF A01 CSCL 03/2

Observations of solar active regions with the Very Large Array have led to a new understanding of the origin and prediction of the solar bursts which disrupt communication systems and interfere with high-flying aircraft. The detailed temperature, density and magnetic structure of coronal loops have been investigated by using observations at 20 cm wavelength. By studying loop evolution on time scales as short as 10 seconds and as long as days, we have obtained new information about preburst temperature enhancements and changes in the magnetic field topology which account for the release and source of burst energy. Multiple wavelength observations were carried out and combined to specify the three dimensional structure of the temperature, density and magnetic field in the solar atmosphere above active regions. This has helped resolve uncertainties in the coronal magnetic field strength, the temperature of the solar atmosphere above sunspots, the physical nature of the coronal loops, and the dominant radiation mechanisms at different levels in the solar atmosphere. We have also specified the positions, size evolution and magnetic structure of solar bursts, thereby obtaining new information about preburst heating, changing magnetic field configurations, and thes nearly simultaneous excitation of bursts at widely separated areas on the solar surface. GRA

N84-24684*# Eppley Lab., Inc., Newport, R.I.
PASSIVE EXPOSURE OF EARTH RADIATION BUDGET EXPERIMENT COMPONENTS (A0147)
John R. Hickey and Francis J. Griffin *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 167-169 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-25587*# California Univ., Berkeley. Dept. of Physics.
HIGH RESOLUTION HARD X-RAY SPECTRA OF SOLAR AND COSMIC SOURCES Ph.D. Thesis
Richard Alan Schwartz 1984 118 p refs
(Grants NsG-7572; NsG-7592)
(NASA-CR-173561; NAS 1.26:173561) Avail: NTIS HC A06/MF A01 CSCL 03B

High resolution hard X-ray observations of a large solar flare and the Crab Nebula were obtained during balloon flights using an array of cooled germanium planar detectors. In addition, high time resolution high sensitivity measurements were obtained with a 300 square cm NaI/CsI phoswich scintillator. The Crab spectrum from both flights was searched without finding evidence of line emission below 200 keV. In particular, for the 73 keV line previously reported a 3 sigma upper limit for a narrow (1 keV FWHM) line .0019 and .0014 ph square cm/sec for the 1979 and 1980 flights, respectively was obtained. Author

N84-24661*# Dublin Inst. for Advanced Studies (Ireland).
A HIGH-RESOLUTION STUDY OF ULTRA-HEAVY COSMIC-RAY NUCLEI (A0178)
Denis OSullivan, Alex Thompson, Cormac OCeallaigh, Vicente Domingo (ESA), and Klaus-Peter Wenzel (ESA) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 101-104 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24662*# Naval Research Lab., Washington, D. C. Lab. for Cosmic Ray Physics.
HEAVY IONS IN SPACE (M0001)
James H. Adams, Jr., Rein Silberberg, and C. H. Tsao *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 105-108 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24663*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
TRAPPED-PROTON ENERGY SPECTRUM DETERMINATION (M0002-1)
Frederick J. Rich (AFGL), Irving Michael (AFGL), Gerald J. Fishman, Paul L. Segalyn (Army Materials and Mechanics Research Center), Peter J. McNulty (Clarkson College of Technology), Y. V. Rao (Emmanuel College), and Christopher E. Laird (Univ. of Eastern Kentucky) *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 109-112 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24664*# Kiel Univ. (West Germany). Inst. for Pure and Applied Nuclear Physics.
MEASUREMENT OF HEAVY COSMIC-RAY NUCLEI ON LDEF (M0002-2)
Rudolf Beaujean, Wolfgang Enge, Georg Siegmon
In NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 113-114 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

N84-24665*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LINEAR ENERGY TRANSFER SPECTRUM MEASUREMENT EXPERIMENT (P0006)
Eugene V. Benton (San Francisco Univ.) and Thomas A. Parnell *In* NASA. Langley Research Center Long Duration Exposure Facility (LDEF) Feb. 1984 p 115-116 (For primary document see N84-24632 15-15)
Avail: NTIS HC A09/MF A01; also available SOD HC CSCL 03B

99 GENERAL

N84-25588*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NONAEROSPACE USES OF JPL TECHNOLOGY: A REPORT ON TECHNOLOGY TRANSFER
Sep. 1983 32 p refs
(NASA-CR-172804; JPL-400-205; NAS 1.26:172804) Avail: NTIS HC A03/MF A01 CSCL 05B

This report examines various nonaerospace applications of JPL technology. JPL has developed and applied a number of models for the effective transfer of space technology to uses in the public and private sector. Successful technology transfers were achieved in the following areas: chromosome analysis; mass spectrometry; manufacturing cost prediction; gas detection by lasers; blood substitutes; ultrasound imaging; composite materials; and detonation and flame arresters. For individual titles, see N84-25589 through N84-25601.

N84-25589*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LABELED CELLS AS RESEARCH, DIAGNOSTIC AND THERA-

PEUTIC TOOLS **c51**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 4-5 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 06C

Scientists at JPL have developed chemical and biological techniques using microspheres filled with drugs, electron-opaque metals, or radioactive, fluorescent, magnetic or electrically charged materials to label specific groups of cells. Synthetic polymeric microspheres are coupled with specific antibodies to form reagents called immunomicrospheres, which can seek out and attach themselves to any specific group of cells. These cell-labeling techniques, therefore, open new avenues not only to the basic study of cells but also to the diagnosis and treatment of many diseases, including cancer. B.W.

N84-25590*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMPUTER-ASSISTED CHROMOSOME ANALYSIS **c51**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 6-7 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 06C

Scientists and engineers at JPL have developed on Automated Light Microscope System (ALMS) that can be used automatically, rapidly, accurately, and routinely to scan, measure, and classify the 46 human chromosomes. The digital image-processing device can operate with either homogeneously stained or Trypsin-Giemsa banded chromosome preparations. This information, which can be presented to physicians in the conventional form of a karyotype, can be a time-saving and cost-effective tool to research laboratories engaged in basic research in genetics, as well as to hospitals and clinical laboratories for the prevention and diagnosis of various human abnormalities due to chromosomal defects. The JPL technology was transferred to the City of Hope National Medical Center in Duarte, California, for the generation of an automatic chromosome-specimen-preparation system. B.W.

N84-25591*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SAMICS: ENGINEERING/ECONOMIC MODEL TO PREDICT COSTS **c83**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 8-9 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 05C

SAMICS (Solar Array Manufacturing Industry Costing Standards) is a simulation model developed by engineers, econmists and system analysts at JPL to evaluate widely diverse production processes that might be used by a hypothetical manufacturer of solar arrays. Based upon a specified level of annual production, the model determines the price of a solar-array manufacturer would have to receive for his product in the marketplace to obtain a specified after-tax rate of return on his equity. The SAMICS methodology can be applied by the use of computer programs or manual procedures. Applicability of the SAMICS model, however, is not confined solely to solar-array manufacture. It is a general enough methodology to be used in any production-line manufacturing operation. B.W.

N84-25592*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MASS SPECTROMETER FOR SIMULTANEOUS DETECTION OF IONS OVER WIDE RANGE OF MASS **c25**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 10-11 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 07D

Scientists at JPL have developd a highly sensitive mass spectrometer, equipped with a novel electro-optical ion detector and minicomputer that can accurately, rapidly, and routinely analyze extremely small samples, especially those of biological materials. It is capable of detecting many ionic species simultaneously. B.W.

N84-25593*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DIGITAL IMAGE PROCESSING OF MUSCLE BIOPSIES **c52**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 12-13 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 06P

Scientists and engineers at JPL have designed and built digital image processing devices that can automatically, quickly, accurately, and routinely scan the strained fibers of muscle tissues to determine each muscle fiber's area, density, circumference, and intensity of color. This information, which can be presented to physicians in the form of histograms, is a powerful tool not only to research laboratories engaged in basic research in muscle biology, but also to hospitals and clinical laboratories for the diagnosis, treatment, and evaluation of various neuromuscular diseases and paralytic conditions. As an example of transfer of this technology, a JPL-developed, digital image processing system for the analysis of muscle fibers is now operating at the University of California at Los Angeles. Author

N84-25594*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ARTIFICIAL BLOOD SUBSTITUTES **c52**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 14-15 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 06A

Under sponsorship of the National Institutes of Heath, investigators at JPL carried out the synthesis of 14 hybrid perfluorocarbon-hydrocarbon compounds as possible candidates for artificial blood substitutes. From a study of these and other perfluorocarbon compounds, rules were developed that permit the reasonably accurate prediction of a compound's vapor pressure, its ability to dissolve oxygen, and its ability to form stable emulsions with non-ionic, polymeric surfactants. These parameters are extremely important in determining whether a compound could be a suitable candidate as an artificial blood substitute. These research results, available in the professional literature, can serve as a useful guide to any person or group contemplating the use of perfluorocarbons as potential artificial blood substitutes. Author

N84-25595*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

HELIUM-NEON LASERS FOR REMOTE MEASUREMENTS OF NATURAL GAS LEAKS **c36**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 16-17 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 20E

A Differential Absorption Lidar (DIAL) system that at a distance of 15 meters can remotely sense natura gas (methane) leaks was developed. The system uses two helium-neon lasers (each emitting a different wavelength), a receiver, and an indium antimonide (InSb) photodetector cooled to 77 K. It is demonstrated the system can defect methane leaks both from an underground gas distribution system. and from sanitary landfills. E.A.K.

N84-25596*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

HELICAL ROTARY SCREW EXPANDERS TO GENERATE ELECTRICITY FROM GEOTHERMAL BRINES **c44**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 18-19 (For primary document see N84-25588 15-99)

Avail: NTIS HC A03/MF A01 CSCL 10A

A 1-megawatt, self-contained, helical rotary screw expander power plant to generate electricity of a geothermal brine wellhead was evaluated. The test support equipment, including a computer-controlled data system, an instrumentation and control van, and a 1000-kilowatt, variable bank were investigated. It was stated that the power was technically feasible although it operated at only about 45% average efficiency. Its technology transfer testing program involved Mexico, Italy, and New Zealand. The mineral laden geothermal brines of Mexico are more prone to scale formation than the Utah brine, and the power plant showed an increase in efficiency to a maximum of 62%. E.A.K.

N84-25597*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ULTRASOUND VISUALIZATION OF CARDIOVASCULAR SYSTEMS **c52**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 20-21
(For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06B

A swept frequency, time delay spectroscopy, ultrasonic scanner with improved operating characteristics as compared to conventional, pulse echo ultrasonic scanners was developed. It is suggested that the ultrasonic scanner could be a powerful tool in hospitals in the diagnosis of atherosclerosis through its risk free, noninvasive, nonionizing, high resolution imaging of arteries. E.A.K.

N84-25598*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMPUTER-AIDED ANALYSIS OF ATHEROSCLEROSIS **c52**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 22-23
(For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 06E

A computer aided, image analysis system that detects and quantitatively measures atherosclerotic lesions as recorded on X-ray angiograms is described. The system provides the most accurate measurement of human femoral and coronary artery disease. This technology was used to determine the actual influence of diet, drugs, exercise, or a combination of these factors, on regression of atherosclerotic lesions. The image analysis system allows examination of angiograms taken over progressive time intervals. E.A.K.

N84-25599*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMPOSITE MATERIALS IN AUTOMOBILE WEIGHT REDUCTION **c24**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 24-25
(For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 11D

The use of composite materials, as a replacement for steel, to reduce automobile structure weight, was studied. The outer panel and intrusion oar of a standard steel automobile door was replaced by a one piece, molded, composite structure of fiberglass/polyester resin. The redesigned door has an appreciable saving in weight on the standard steel door. E.A.K.

N84-25600*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DETONATION-AND-FLAME ARRESTERS FOR GASOLINE-VAPOR RECOVERY SYSTEMS **c31**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 26-27
(For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 13I

Flame and detonation arrester technology is discussed. The technology which can be incorporated into vapor recovery systems which transfer gasoline cargos between ships and marine terminals in seaports is evaluated. E.A.K.

N84-25601*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

FLASHBACK FLAME ARRESTERS FOR FUEL CARGO TANKS **c37**

In its Nonaerospace Uses of JPL Technol. Sep. 1983 p 28-29
(For primary document see N84-25588 15-99)
Avail: NTIS HC A03/MF A01 CSCL 13I

Simulated flashback flames on a cargo tank vent tube on ships or barges were studied. It is found that four different types of flame arrester devices are affective for eight different volatile liquid fuels. E.A.K.

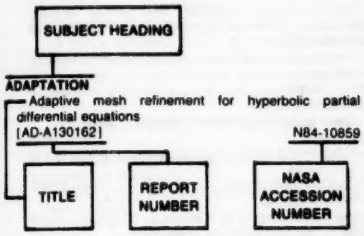
N84-25602*# National Aeronautics and Space Administration, Washington, D. C.

ASTRONAUTICS AND AERONAUTICS, 1976. A CHRONOLOGY

Eleanor H. Ritchie 1984 392 p
(NASA-SP-4021; NAS 1.21:4021) Avail: NTIS HC A17/MF A01 CSCL 05D

A chronology of events concerning astronautics and aeronautics for the year 1976 is presented. Some of the many and varied topics include the aerospace industry, planetary exploration, space transportation system, defense department programs, politics, and aerospace medicine. The entries are organized by the month and presented in a news release format. M.A.C.

Typical Subject Index Listing



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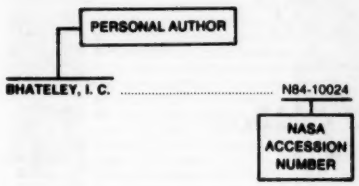

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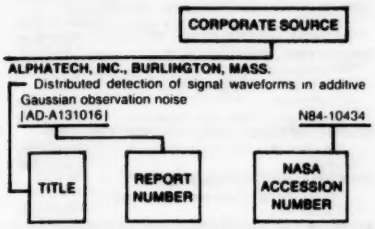

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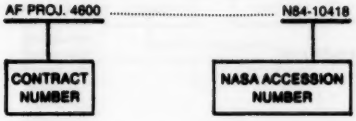

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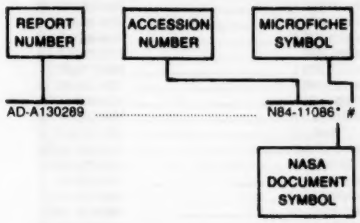

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